

2014 Water Conservation Strategy



Prepared for the City of Nanaimo
by AquaVic Water Solutions Inc.
December 2013



Executive Summary

Approximately 88,000 people rely on the City of Nanaimo water supply system for their water. The water comes from the Nanaimo River watershed as surface water out of the South Fork of the Nanaimo River. The river and watershed provide important habitat areas and recreational opportunities, and minimizing the amount of water we remove from the river and watershed is necessary to ensure our water resources and local environment stay healthy and secure.

The City of Nanaimo has long taken pride in being a leader in water conservation. Water meters were introduced for individual properties in the 1970's, and expanded block water rates with full-cost accounting were introduced in the early 1990's. Both of these measures are now recognized as best practices for water conservation. The City developed its first water conservation strategy in 2003, and updated the strategy in 2008. This 2013 Water Conservation Strategy updates and expands upon this history of water conservation planning.

The 2008 Water Conservation Strategy included a target of 15% reduction in water production per capita (total water use across the city divided by the population) by 2035. This target was based on 2003 water production, and was met in 2010.

The City of Nanaimo Strategic Plan (2012-2015) set a target for a 10% reduction in per capita water use per decade. A 10% per capita reduction per decade is in line with the reductions achieved between 2002 and 2012 (11%). However, looking at a longer time frame, the city has only achieved a 5% reduction between 1984 and 2012, less than 2% per decade. Achieving the long-term target of 10% reduction per decade will require increased investment and commitment from the City of Nanaimo and its local partners to dramatically reduce water use across the City.

The City has many measures currently in place to conserve water, including water regulations, education, rebates, and water loss control systems. The 2008 Water Conservation Strategy identified two priorities for water conservation efforts:

- Minimize leaks
- Educate the public

Some notable measures since 2008 include the introduction of a toilet-rebate program in 2009, additional public outreach initiatives in partnership with Team WaterSmart, and the execution of a city-wide water audit in 2012. The toilet rebate program has saved approximately 578 million litres of water since the program began in 2009. The water audit revealed that the City's Infrastructure Leakage Index (ILI) is excellent (i.e. leakage is very low).

To continue progress towards the target of 10% reduction in per capita water demand per decade, the City has identified priority measures that may be added to the suite of existing water conservation activities during the period of 2014 to 2018. The next review of the water conservation strategy is planned for 2018.

The priority measures were selected based on the priorities for water conservation in the City Strategic Plan of 2012 to 2015, and the outcomes of two Community Advisory Group workshops. The City has also worked together with The Regional District of Nanaimo (RDN) to identify water conservation activities that may be undertaken collaboratively. Individual measures will require detailed plans and budgets to be prepared. The priority measures are listed in the box below.

Priority Water Conservation Measures

2014 - 2018

- (1) Expand toilet rebate program
- (2) Educate on grey-water use, water-efficient landscaping and irrigation technologies
- (3) Consider incentives for water-efficient development
- (4) Develop strategy for large-volume water users
- (5) Carry out water audit recommendations for system management
- (6) Enhance water billing information
- (7) Run a “golden lawns” campaign
- (8) Offer a smart-irrigation technology rebate
- (9) Expand Team WaterSmart activities
- (10) Expand rainwater harvesting incentives
- (11) Align water restrictions

The 2014 Water Conservation Strategy was adopted by Council on June 9th, 2014

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Please Note

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1. Introduction

Water is a very precious resource. We owe it to ourselves to use this resource wisely, minimize any waste, and ensure our use of it is sustainable. British Columbia's Living Water Smart Plan encourages us to commit to ensuring our water resources stay healthy and secure. The City of Nanaimo has shown its commitment to this vision through many years of water conservation initiatives and through the City's current efforts to develop new strategies for achieving even greater water conservation.

Water Conservation in British Columbia

The provincial government of British Columbia has several programs and initiatives in place supporting water conservation. Most notably, *Living Water Smart: British Columbia's Water Plan* outlines provincial policies and positions that encourage the careful management of water across the province. Some excerpts from *Living Water Smart* are included in the box on this page.

The BC Green Building Code Initiative also contributes to water conservation efforts in the province. It focuses on reducing the energy and water use of buildings by requiring energy-efficient and water-efficient fixtures in new buildings

"Adapting to climate change and reducing our impact on the environment will be a condition for receiving provincial infrastructure funding."

"Fifty percent of new municipal water needs will be acquired through conservation by 2020."

"By 2020, water use in B.C. will be 33 percent more efficient."

Excerpts from Living Water Smart: British Columbia's Water Plan (2008)

Water Conservation in the City of Nanaimo

The City of Nanaimo has long taken pride in being a leader in water conservation. Water meters were introduced for individual properties in the 1970's, and expanded block water rates with full-cost accounting were introduced in the early 1990's. Both of these measures are now recognized as best practices for water conservation.

The City developed its first water conservation strategy in 2003, and updated the strategy in 2008. This 2013 Water Conservation Strategy updates and expands upon previous water conservation planning. The 2008 City of Nanaimo Water Conservation Strategy described a number of actions being considered, developed or executed by the City to conserve water and reduce demand, as well as goals for reducing water consumption.

Key targets and goals in the 2008 Water Conservation Strategy were:

- Reduce overall per capita water use by 15% by 2035 (from 2003 levels), to 510 litres per person per day
- Minimize leaks
- Educate the public on water use

The per capita water use target of 510 litres per person per day was reached in 2010, and met in 2011 and 2012 as well. A number of measures have been implemented since 2008 and are described in more detail in Section 5 of this document. One notable measure was the execution of a city-wide water audit in 2012, which has revealed that the City's Infrastructure Leakage Index (ILI) is excellent (i.e. leakage is very low), and per capita consumption is well below the Canadian and provincial average. Per capita consumption is also below the Capital Regional District average, where an aggressive water conservation program has been in place for several years.

The City of Nanaimo has seen reductions in per capita water use through the period of 2002 to 2012, seeing decreases in both average and peak summer water use. One initiative during this period was the toilet rebate program, which has saved approximately 578 million litres of water since the program began in 2009.

The City of Nanaimo 2012 to 2015 Strategic Plan identifies water as one of six strategic priority areas for the city and sets the stage for improvements to the water supply system and further water conservation efforts, including ambitious conservation targets and the promotion of innovative technologies.

In 2007, the City produced a 50-year vision for the City's water supply, reported in the Water Supply Strategic Plan. The plan includes a review of the water supply system, the capacity of the current water source and alternative sources, projected demand, and management recommendations. Three primary goals were identified in the plan as follows:

- (1) Provide safe drinking water
- (2) Ensure a sustainable water supply
- (3) Provide cost effective water delivery

Additionally, the Water Supply Strategic Plan recognizes water as a shared resource, and emphasizes the need for both supply-side and demand-side management initiatives to enhance water conservation measures. These actions ultimately affect the quality and quantity of our water source, and water available for other ecosystems.

Integrated Planning

This water conservation strategy directly supports the initiatives of the following guiding documents, plans and regulatory policies:

- **City of Nanaimo 2012 to 2015 Strategic Plan** – This plan presents a vision and ambitious targets for water, one of the priority areas identified by the City.
- **Nanaimo River Water Management Plan** – A plan to sustain the water resources and identify management strategies for the optimal long-term benefit of all water use interests within the Nanaimo River Basin, including First Nations and downstream fisheries.
- **Living Water Smart, British Columbia’s Water Plan** – The province’s water plan, recognizing that a plentiful amount of clean water is needed for our growing communities, economic growth, healthy food, clean energy and beautiful environment.
- **City of Nanaimo, Official Community Plan (OCP)** – The OCP ensures the community can continue to grow and prosper while maintaining environmental quality, and by developing a conservation mindset towards water use.
- **Community to Community Water Agreement (between the City of Nanaimo and Snuneymuxw First Nation)** – The agreement acknowledges that water is a shared resource and that both parties are committed to regional water use principles, including conservation.
- **Water Supply Strategic Plan** – A plan for ensuring an adequate water supply system that can serve the growing population within the water system delivery area.
- **Green Building Code (BC Initiative)** – Supports the use of water saving plumbing fixtures.

Planning Framework

This update of the Water Conservation Strategy was prepared according to the following process:

1. Creating and updating graphs to analyze current water use and trends;
2. Reviewing existing planning documents related to water supply and management in the City of Nanaimo;
3. First meeting with the Community Advisory Group (CAG) to receive input on water conservation partners, goals, and measures (see report in Appendix A);
4. Creation of a draft strategy, including a short-list of new water conservation measures;
5. Second meeting with the CAG to build partnerships and detail plans for new water conservation measures (see report in Appendix B); and
6. Creation of the 2013 Water Conservation Strategy (this document).

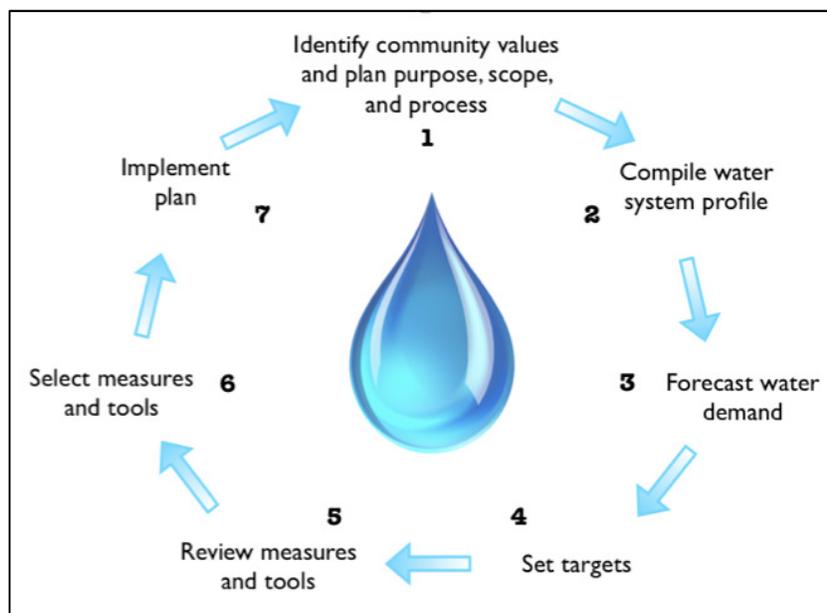


Figure 1. Water conservation planning framework
(after Wong et al. 2009)

The planning framework for this water conservation strategy builds on both the USEPA Water Conservation Plan Guidelines (1998), and the Water Conservation Planning Guide for British Columbia's Communities from the University of Victoria's POLIS Project (Wong et al. 2009). The planning process outlined in the Water Conservation Planning Guide for British Columbia's Communities is summarized in Figure 1. This is reflected in the outline of this document.

2. Water System Profile

There are approximately 88,000 people on the City of Nanaimo water supply system, including the citizens of Nanaimo, the community of Extension, and the majority of the Snuneymuxw First Nation. Water is supplied from the Nanaimo River watershed, as surface water out of the South Fork of the Nanaimo River. This water is disinfected with chlorine and travels through a supply network of reservoirs and water mains, almost entirely propelled by gravity, ultimately reaching users. Figure 2 shows a map of the distribution network. The Nanaimo City water supply and distribution system includes:

- 3 raw water storage dams
- 8 reservoirs for treated water
- 90 km of supply mains
- 529 km of distribution mains
- 2,952 fire hydrants
- 24,783 water meters

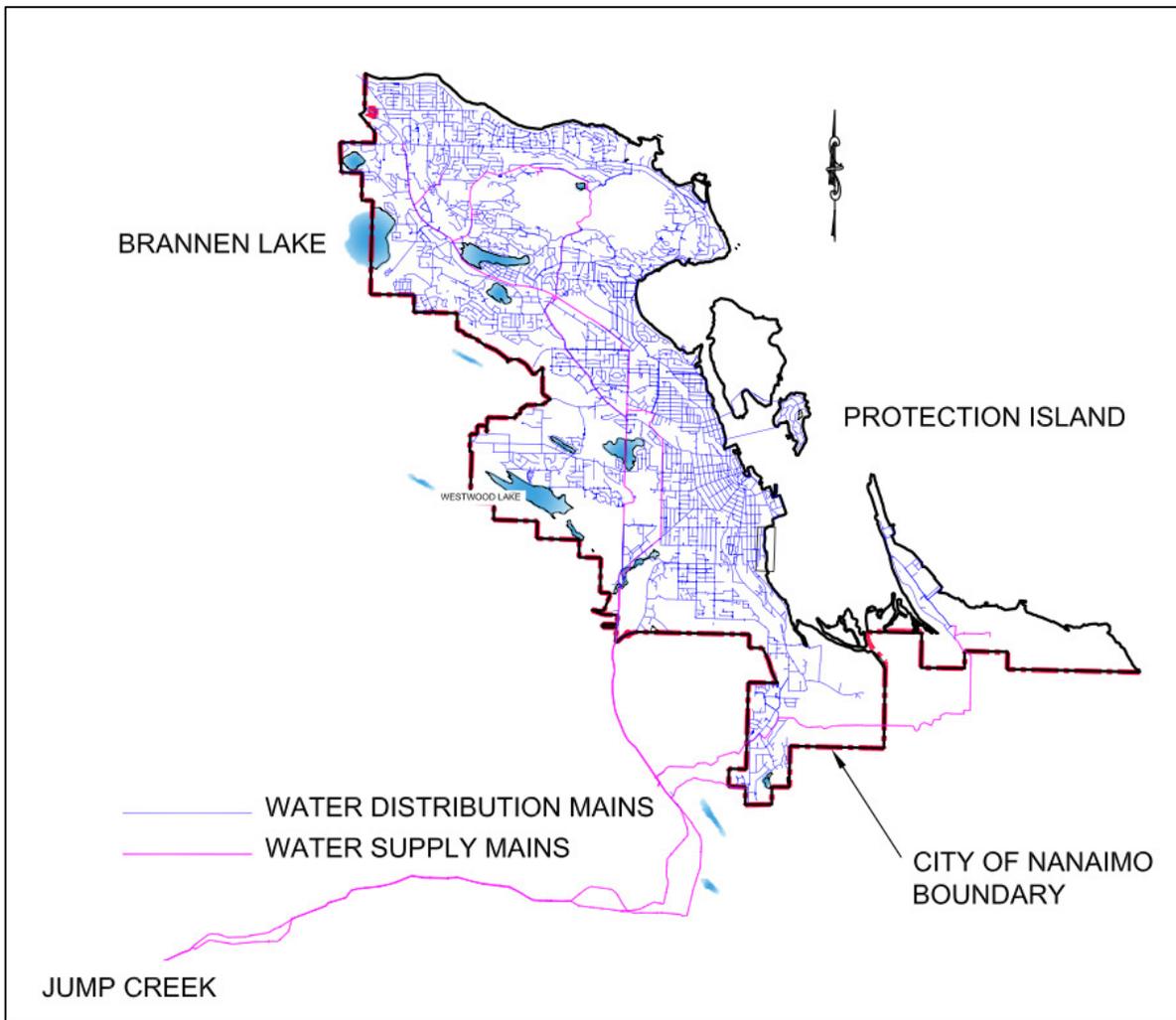


Figure 2. Map of the City of Nanaimo Water Supply System

Currently, the City of Nanaimo is building infrastructure for a new water treatment plant. The new treatment plant will employ membrane filtration and secondary chlorination, and a new enclosed reservoir will replace the old, open-air reservoir #1. The new reservoir will hold 14 ML of treated water, downstream of the new water treatment plant. The City expects to commission the reservoir and the treatment plant in 2014 and 2015 respectively. The water treatment plant will be able to produce water for up to 124,000 people, and can be expanded when required.

While much of the Nanaimo water supply system is fairly new compared to many western cities, the South Fork Dam is 82 years old, and some major raw water supply lines are over 59 years old. These older components are being considered for replacement, redundancy and preventative maintenance measures to avoid failure or interruption of water supply. In the case of an interruption in supply from the single source (South Fork Dam), mobile pumps and treatment stations are capable of supplying emergency water to various points in the distribution network, by pumping and filtering water from other sources. Further information on the water supply system is presented in the 2007 Water Supply Strategic Plan.

3. Water Use

Historic and Current Water Use

The amount of water used by the City of Nanaimo is closely tied to size of the population, which has been growing since Nanaimo’s water supply system was first constructed over 130 years ago. Total water production by the City of Nanaimo has increased as the population has grown, but since 2000 the total water production has remained relatively stable while population has continued to increase. Figure 3 shows annual water production from 1980 to 2012. Nanaimo currently uses approximately 16,000 ML each year; a quantity of water nearly equal to the volume of the reservoir storage capacity of the system.

Water production – total amount of water taken from reservoirs and entering the water supply system

Peak day production – the amount of water entering the water supply system on the day of the year with the highest water production

Per capita water production – water production divided by the population served by the supply system

Residential water use – the amount of water delivered to residential customers

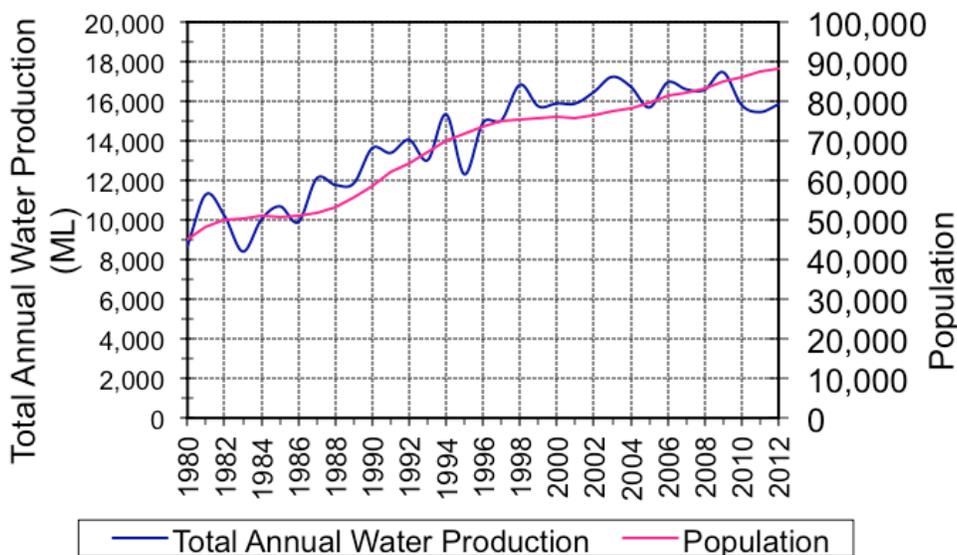


Figure 3. Nanaimo's population and water production

Since the 1980’s, average water production per capita has fluctuated around 500 – 600 litres per person per day (Figure 4). Figure 4 also shows peak day production, which dropped significantly between 1990 and 1992, when the City introduced full-cost accounting (entire cost of building, operating and maintaining the water supply system is paid by user rates). Peak water production is important to manage

because the design of many elements of the water supply system are specified for peak demand, including large water mains, reservoirs and treatment plants. In 2011 peak per capita production was the lowest it has been in over 30 years. Figure 5 shows the years 2002 – 2012 in detail, showing a steady decrease in both average and peak day production per capita over this period.

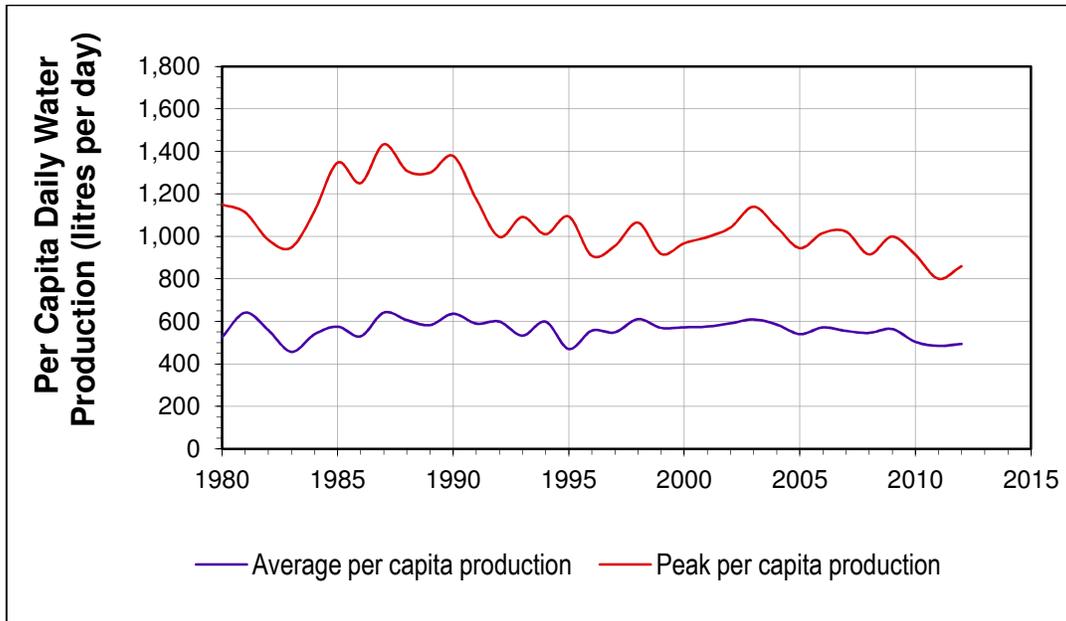


Figure 4. Average and peak per capita daily water production 1980 - 2012

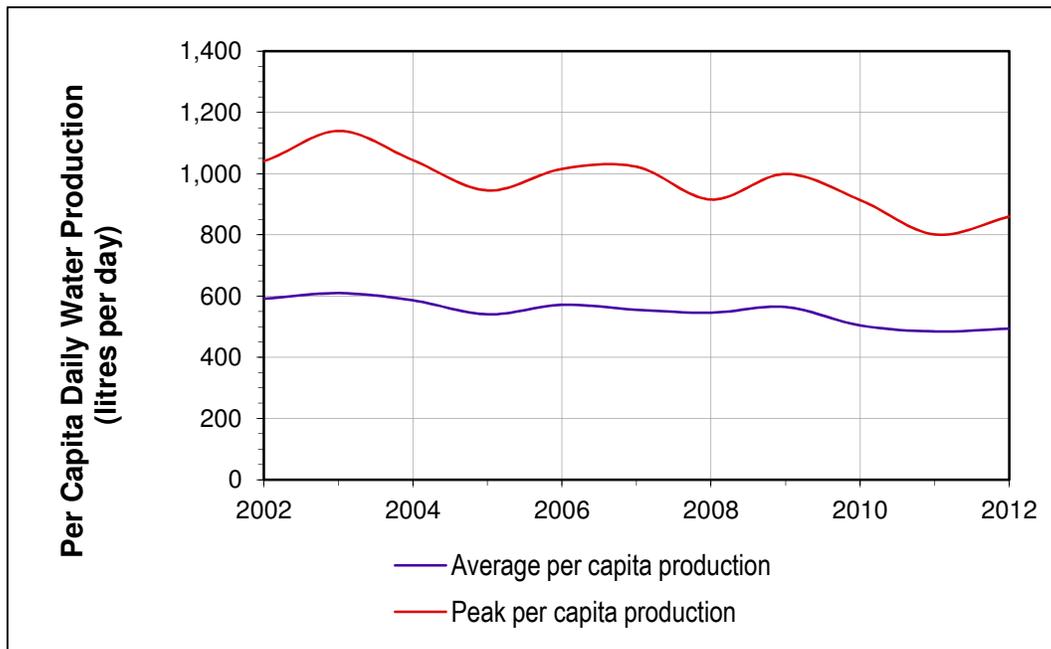


Figure 5. Average and peak per capita daily water production 2002 - 2012

Average daily water production for the years 2008 to 2011 is shown in Figure 6. High summer water use is observed from May through September, and at its peak is twice the demand throughout most of the year. The peak day each of these years occurred in July or August.

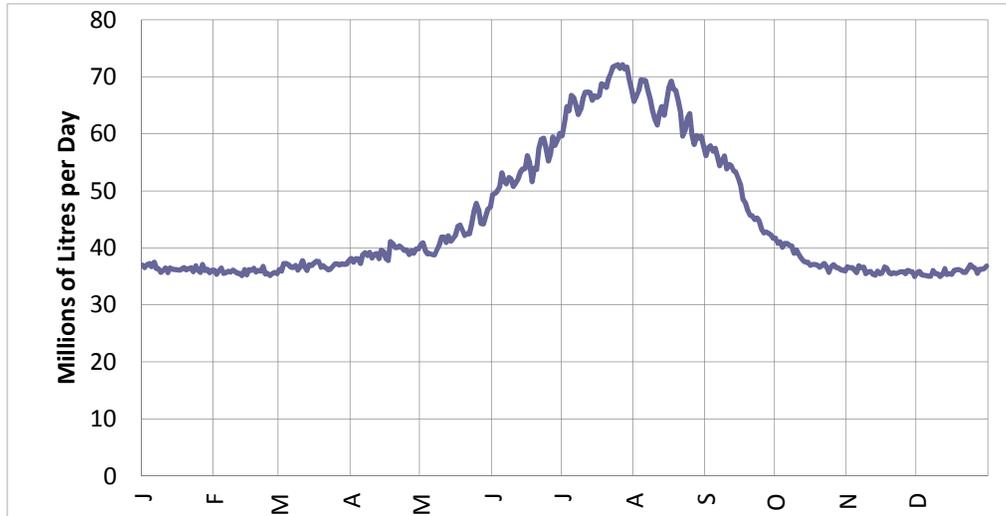


Figure 6. Average seasonal variation in water production 2008 to 2011

The City of Nanaimo has relatively low water demand for its population in comparison to national and provincial averages. Figure 7 shows water production and residential water use in 2011 for Nanaimo as compared to the averages in BC and Canada.

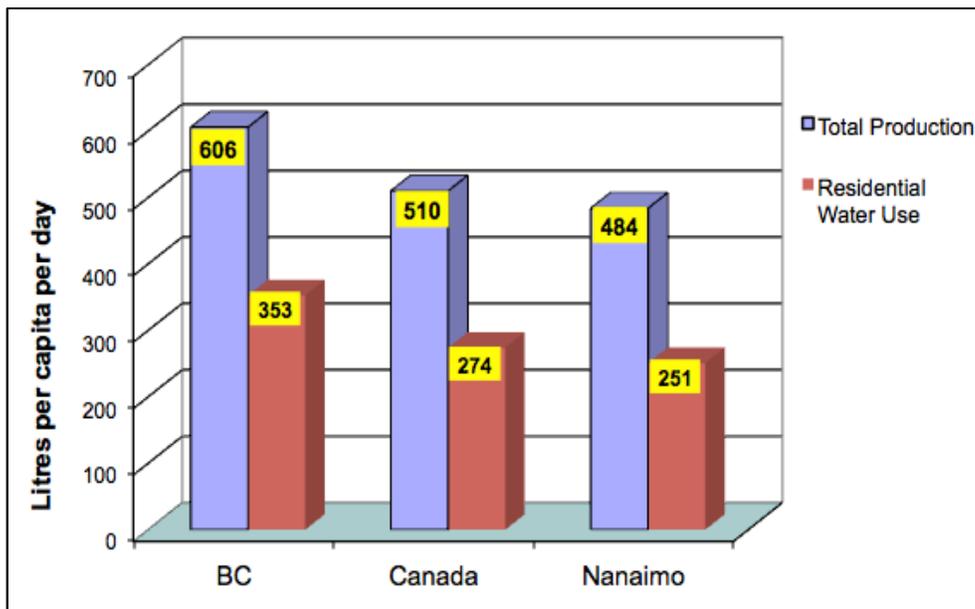


Figure 7. Average per capita water use comparison

Sources: BC and Canada information from the 2011 Environment Canada Municipal Water Use Report. City of Nanaimo information from the 2012 Water Audit.

Types of Water Use

The water produced by the City of Nanaimo serves a wide range of customers and water uses. A pie chart showing the categories of water use in 2011 is shown in Figure 8.

Just over half of the water produced by the city is delivered to residential customers. Descriptions of the other types of water uses are given in the box on this page. The 2012 Water Audit confirmed that the City’s Infrastructure Leakage Index (ILI) is excellent, meaning that the volume of leaks is close to the minimum of what is technically achievable. Refer to the 2012 Water Audit for further information.

Total water use includes:

- Municipal** – City of Nanaimo infrastructure including parks and pools
- Government** – Schools, hospital, universities, bulk water and non-city government infrastructure and buildings
- Commercial** – Malls, nursing homes, hatcheries, and some mixed commercial and residential
- Residential - multi family** – mostly single-family dwellings with a suite, also duplexes and mobile home parks
- Residential - single family** – single family dwellings
- Authorized Unbilled** – firefighting, flushing water mains, cleaning reservoirs

Source: 2012 City of Nanaimo Water Audit

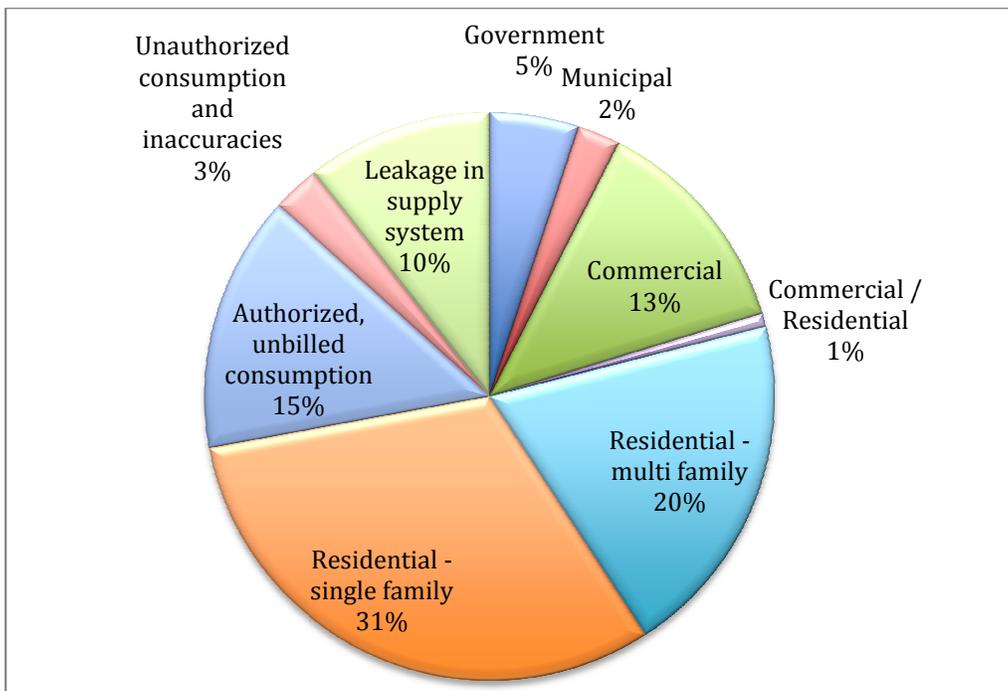


Figure 8. Water Use By Category, 2011

Water Use Projections

Future water demand depends primarily on two factors: (1) the change in water production per capita, and (2) the change in population in the City. Each of these is discussed below.

Per Capita Water Production

Water production per capita will depend on how water use changes in the City, across all types of water use described above. Techniques and technologies for water conservation are becoming more sophisticated, less expensive, and more accessible. National and regional trends indicate that household water use is decreasing. The current trajectory of diminishing water use may be increasingly difficult to maintain, however, as simple reductions in water use are achieved and more significant changes to behaviour and technology become necessary. Another factor expected to influence future water use is climate change, which is broadly anticipated to result in hotter, drier summers for the region, increasing outdoor water use. Other trends can also affect water use across the city, such as a shift towards growing food locally, or increased industrial activity in the City.

Two scenarios are included in this section for per capita water production: (1) no reduction in per capita water production from 2007 levels and (2) reduction of per capita water production by 10% per decade from 2007 levels. The 10% per decade target was established in the 2012-2015 City of Nanaimo Strategic Plan. Water projections are from a recent year with low precipitation and high-water use (2007) to account for possible low-precipitation years in the future, as expected from natural variation and climate change.

Two scenarios are used in the water use projections:

- (1) No reduction from 2007 per capita water production
- (2) 10% reduction in per capita water production each decade from 2007

To observe trends in water use this section of the report uses **rolling five-year averages**, where each data point is an average of the previous 5 years. The use of rolling five-year averages reduces the appearance of annual fluctuations and provides a clearer picture of the overall trend. Figure 9 shows rolling five-year averages of water production per capita from 1985 to 2012 and projections from 2007 to 2055 based on the two future scenarios. A major reduction in peak water production has been achieved since 1990 when pricing changed to full-cost accounting and expanded block-rate. Summer outdoor water use was significantly reduced in response to the new pricing method.

Average water production has shown a steady reduction since 2004, but does not show an obvious trend over the longer period of 1985 to 2012. The relatively steady average water production since the 1980's, in contrast to the significant reductions seen in peak water production over the same period, suggests that achieving significant reductions in average water production will require a substantial investment in water conservation efforts.

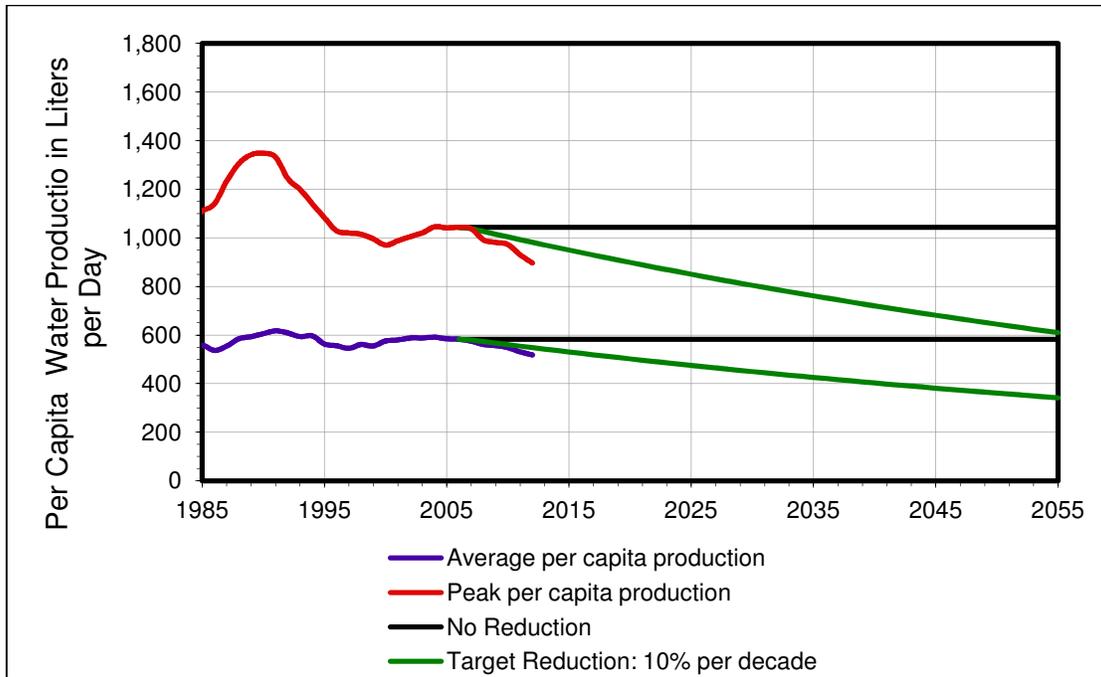


Figure 9. Rolling five-year averages and projected per capita water production

Population

The total water use of a city is closely tied to the size of the population. This holds true for Nanaimo, as shown in Figure 3. Assuming that the population of Nanaimo continues to grow at 1.5% per year, the resulting population is shown in Figure 10. The growth rate of 1.5% was used in the Water Supply Strategic Plan of 2007. This projection of population growth is regularly reviewed.

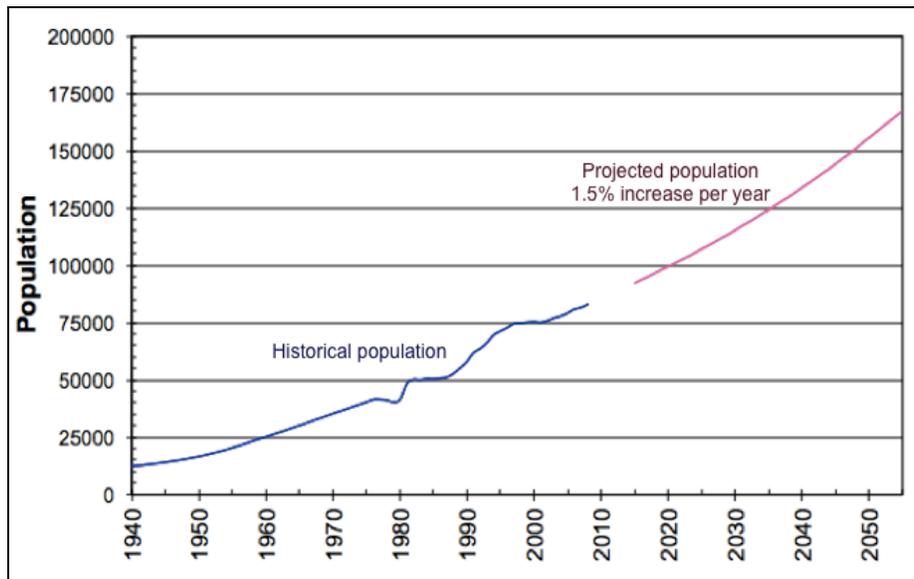


Figure 10. Historic and projected population of the City of Nanaimo 1940 - 2055

4. Conservation Goals and Targets

Water conservation goals outline the benefits that a community would like to realize from water conservation. Water conservation targets are specific and quantifiable objectives for water conservation that help to ensure the desired benefits are achieved.

Goals

There are many benefits of water conservation. Several key goals of water conservation in the City of Nanaimo are listed in Table 1.

Table 1. Water Conservation Goals

Protect the natural environment
1. Protect and preserve natural water resources.
2. Reduce the amount of greenhouse gases (GHG) that are produced when treating and moving water and wastewater.
Reduce water supply costs
3. Eliminate, reduce, or postpone the costs of new infrastructure, including reservoirs, treatment facilities, pumping stations and pipelines.
4. Lower variable operating costs, for example energy costs and water treatment costs.
Improve water supply
5. Improve ability to provide water services with water of appropriate quality and quantity to meet customer needs.
6. Improve drought and emergency preparedness.

Targets

The 2008 Water Conservation Strategy set a target of 15% reduction in water production per capita by 2035. This goal was based on 2003 water production (600 litres per capita per day), giving a target of 510 litres per capita per day in 2035. This target was met in 2010, and water production was even lower in 2011 and 2012, staying below this target.

The City of Nanaimo Strategic Plan (2012-2015) identified water as one of six strategic priorities, and noted that a 10% reduction in per capita water use per decade is desired. As in section 3 of this report, the 10% per decade target is projected from 2007 levels. Achieving this target would result in average water production of 426 L per capita per day and peak water production of 769 L per capita per day by 2035.

10% Reduction per Decade Targets

- 1) Average water production of 426L per capita per day by 2035
- 2) Peak water production of 769L per capita per day by 2035

In comparison to historical per capita water use trends, 10% per decade is in line with the reductions achieved between 2002 and 2012 (11%). However, looking at a longer time frame, the city has only achieved a 5% reduction between 1984 and 2012, less than 2% per decade. Achieving the long-term target of 10% reduction per decade will require increased investment and commitment from the City of Nanaimo and its local partners to dramatically reduce and sustain lower water use across the City.

5. Water Conservation Measures

The City of Nanaimo has taken steps to conserve water as early as the 1980's, implementing universal customer metering and an inclined block water rates pricing structure. The City has many measures currently in place to conserve water including regulations, education, rebates, and water loss control systems. A list of the existing measures are provided in Appendix C.

The 2008 City of Nanaimo Water Conservation Strategy describes actions taken and planned by the City to conserve water. Two key priorities identified in the 2008 Water Conservation Plan were:

- Minimize leaks
- Educate the public

Both of these priority areas have been developed. Some notable measures since 2008 include the introduction of a toilet-rebate program in 2009 and the execution of a city-wide water audit in 2012. The water audit revealed that the City's Infrastructure Leakage Index (ILI) is excellent (i.e. leakage is very low). Additional public outreach initiatives have also been introduced in the City in partnership with the Regional District of Nanaimo and their Team WaterSmart activities within the regional Drinking Water and Watershed Protection plan.

The toilet rebate program has saved approximately 578 million litres of water since the program began in 2009. A total of \$260,000 has been allocated to the toilet rebate program between 2009 and 2012, and 4126 toilets were replaced under the program during this time. Homeowners are able to claim \$50 for the replacement of a toilet with a water efficient one. While the program continues to be well-used, \$7,400 of the \$50,000 allocated in 2012 went unclaimed. In February 2013 The Development Process Review Committee recommended that the program be reviewed within the development of this Water Conservation Strategy. The program was reviewed as part of the Community Advisory Group workshop in April 2013, with recommendations described in Section 6 of this report.

6. Priority Measures 2014 to 2018

To continue progress towards the target of 10% reduction in per capita water demand per decade, the City has identified a number of measures it may add to the suite of existing water conservation activities during the period of 2014 to 2018. The City Strategic Plan of 2012 to 2015 (Strategic Plan) includes a number of priority measures for water conservation, and two Community Advisory Group workshops identified several additional activities. The Regional District of Nanaimo (RDN) and the City have also identified several activities they may undertake together. This is in line with the City's Strategic Plan, which committed to "*continued and strengthened partnerships with RDN and Team WaterSmart with emphasis on public education, water conservation programs/initiatives, and water smart behaviour change.*" The City's priority water conservation measures are described below, and all measures that may be undertaken in 2014 to 2018 are also included in Appendix C.

Conservation Measures

1. Expand toilet rebate program

The review of the successful toilet rebate program concluded with the recommendation that the program be expanded to multi-family buildings such as apartment buildings for one to two more years. Currently the rebate can only be claimed for a maximum of two toilets per property. It is recommended that two programs be run in 2014, one for single-family residences (\$50,000) and one for multi-family residences (\$50,000). This recommendation aims to capitalize on the popularity of the program by achieving another one to two years of high uptake, understanding that the program has a limited life span as water efficient toilets become standard. It was also noted that the toilet suppliers were a critical source of education to residents about the program, and advertising through suppliers could be emphasized.

2. Educate on grey-water use,

Priority Measures 2014 to 2018

- (1) Expand toilet rebate program
- (2) Educate on grey-water use, water-efficient landscaping and irrigation technologies
- (3) Consider incentives for water-efficient development
- (4) Develop strategy for large-volume water users
- (5) Carry out water audit recommendations for system management
- (6) Enhance water billing information
- (7) Run a "golden lawns" campaign
- (8) Offer a smart-irrigation technology rebate
- (9) Expand Team WaterSmart activities
- (10) Expand rainwater harvesting incentives
- (11) Align water restrictions

water-efficient landscaping and irrigation technologies

The City will encourage the uptake of technologies and landscaping that reduce water use, specifically emerging ones including grey-water use, water-efficient landscaping and irrigation technologies. Grey-water systems are increasingly popular but still uncommon in the City of Nanaimo. The BC Building Code includes specifications on grey-water systems and the City building inspectors facilitate their incorporation into buildings in the City. To further support their use the City may provide information on the City website about how to design and install grey-water systems, examples of them, and a statement that the City supports their use.

The City may also provide information online to encourage water-efficient landscaping, such as a link to a landscape irrigation calculator, a list of certified irrigation professionals locally, and information on upcoming workshops under Team WaterSmart activities. As listed in the Strategic Plan, the City will also “model sustainable water practices” by integrating and demonstrating rainwater harvesting, grey-water recycling, smart irrigation and low water-use landscaping on City grounds. New City buildings should also consider including grey-water recycling and rainwater systems.

3. Consider incentives for water-efficient development

The Strategic Plan includes a commitment to encourage “Integrated Building Water Management systems in new residential, industrial and commercial construction (including rain water catchment, grey water recycling, and smart irrigation technology)”. To support this, the City will explore the possibility of incentives for developments to design and build water-efficient buildings and landscapes.

4. Develop strategy for large-volume water users

The City has a number of institutions and facilities that use very large volumes of water (e.g. Vancouver Island University, School District 68, the Nanaimo Regional General Hospital, the Biological Station, Beban Park, the Aquatic Centre, and the Nanaimo Seniors Village). The City will develop a strategy for working with large-volume water users to reduce water use. This strategy may include meeting with the large water users to perform water audits and discuss targeted incentive programs for replacing fixtures or other water-saving investments. This is in line with the Strategic Plan’s commitment to “encourage water audits for large residential, mall, commercial and industrial developments”.

5. Carry-out water audit recommendations for system management

The 2012 water audit recommended several actions that may contribute to reducing water use across the city, including testing and replacing water meters, developing a bulk metering plan, night-time pressure management, and performing regular subsequent water audits. The City plans to act on these recommendations, which will require financial investment.

6. Enhance water billing information

The City's Strategic Plan includes a commitment to "enhance water billing information to encourage awareness and wise use of water". The City will develop a more informative and visual water bill for both online and paper billing. Bills may show trends in household water use and a comparison with average water use in the community. In parallel with this, online tools for residents to monitor and track their water use may be created.

7. Run a "golden lawns" campaign

The City may run a "golden lawns" campaign, providing lawn signs for homeowners to put on their lawn that communicate the environmental benefits of conserving water by not watering lawns, allowing them to go "golden" during the summer. This campaign may be carried out in collaboration with the Regional District of Nanaimo, local habitat and conservation groups, and in conjunction with the Team WaterSmart residential irrigation audits.

8. Offer a smart-irrigation technology rebate

The City will explore the possibility of offering a rebate aimed at improving household water efficiency related to outdoor use (e.g. smart-irrigation technology.) Eligibility for rebates associated with the purchase of hardware (i.e. monitoring devices) could require system installation by a certified irrigation technician.

9. Expand Team WaterSmart activities

Team WaterSmart undertakes a host of popular educational outreach activities around water conservation as part of the Drinking Water and Watershed Protection Program of the Regional District of Nanaimo. The activities of Team WaterSmart will be expanded with some ideas including:

- Support School District 68 to host a competition between high schools to create demonstration water-efficient sites on school grounds;
- Host workshops at schools and organize field trips to City water infrastructure;
- Expand the popular residential irrigation check-up campaign;
- Host a tour of grey-water systems;
- Host an event with a celebrity gardener at a water efficient demonstration site; and
- Prepare a simple indoor water conservation kit that includes a water efficient faucet, showerhead, and device to save water in toilet cisterns.

10. Expand Rainwater Harvesting Incentives

The RDN provides rebates for rainwater harvesting systems throughout the regional district. There is high demand in some areas, including Gabriola Island and Lantzville, but demand is low within the City of Nanaimo. The City will promote the rainwater harvesting rebate program, and will consider providing additional funding to the program if demand within the City increases.

11. Align Water Restrictions

Summer water restrictions are similar but not the same between the City and the RDN. This causes some confusion and frustration for residents. The City and the RDN will explore the possibility of aligning the water restrictions regionally to improve communication with the public.

7. Implementation Strategy

City of Nanaimo staff will prioritize the measures described in this strategy over the years 2014 to 2018, preparing detailed plans and budgets for the individual measures that will be implemented. Appendix C lists the measures that may be implemented, as well as the City department that may take the lead for select measures.

Partnerships with the Regional District of Nanaimo, organizations and individuals in the community have been initiated and strengthened during the preparation of this water conservation strategy. These partnerships have helped to identify opportunities for water conservation that are specific for the City, and they will be important for carrying out the activities. The Regional District of Nanaimo and the City have identified activities that may be undertaken together. This is an important partnership, and the City will continue to work with the RDN to identify activities that can be delivered in partnership. The City will communicate and work with partners wherever possible while putting the new water conservation measures into practice and during future reviews of the water conservation strategy.

Successful water conservation programming requires regular review to ensure it is having the desired effect and to respond to changing conditions. The next review of the water conservation strategy is planned for 2018.

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Appendix A: Community Advisory Group Meeting #1 Report

Meeting Date: 15th November 2012

Time: 9:00 – 11:00 am

Location: City of Nanaimo Rotary Field Clubhouse located at 850 Third Street

Abbreviations:

iDUS iDUS Controls Ltd

RDN Regional District of Nanaimo

VIHA Vancouver Island Health Authority

VIU Vancouver Island University

Participants:

Ron Hartman iDUS

Lori Barlow iDUS

Daryl Amos VIU

Bill McCracken Energy Solutions for Vancouver Island

Mike Donnelly RDN

Christina Metherall RDN

Julie Pisani RDN

Euan Wilson City of Nanaimo

Bill Sims City of Nanaimo

Rob Lawrence City of Nanaimo

Vernon Rogers AquaVic

Katherine Trajan AquaVic

Agenda

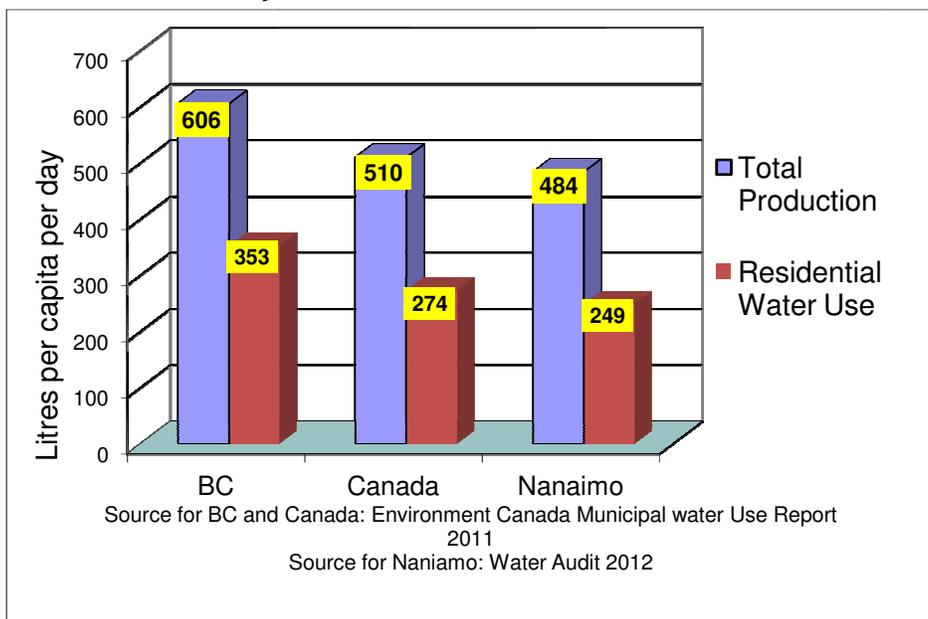
Time Start	Description
8:50	Coffee and Tea
9:00	Arrivals
9:15	Welcome and Introductions
9:30	Presentation - City of Nanaimo Water Supply and Demand
9:40	Presentation - Water Conservation in the City of Nanaimo
10:00	Discussion - Nanaimo's water future – who needs to be involved?
10:35	Discussion - Goals and targets – what should we aim for?
10:50	Discussion - Innovative measures – what are the priorities?
11:15	Meeting concluded

Meeting Highlights

Profile of the City of Nanaimo water system

Euan Wilson presented information on the City’s water supply, treatment, and distribution system, and on historical, current, and projected water use.

1. Total water production (water entering the City distribution system) is increasing with population growth
2. A major reduction in peak (maximum day) per capita water production was seen with the introduction of full-cost pricing in 1992
3. Average day per capita water production has fluctuated between 420 - 620 litres/person/day over the past 30 years
4. The City of Nanaimo uses less water per capita than the Canada and BC averages for both total water production and residential water use (water delivered to residential customers)



5. According to the 2012 Water Audit, system losses are less than 11% of total flow, which is very low for a water supply system
6. Customer water use (water delivered and billed to customers) in 2011 was:
 - 43% Residential Single-Family Dwelling
 - 27% Residential Multi-Family Dwelling (e.g. mobile home parks, condos)
 - 18% Other (e.g. nursing homes, commercial centres, hotels)
 - 7% Government (e.g. VIU, schools, sewer treatment plant)
 - 3% Municipal (e.g. parks, recreation centres, fire hall)
 - 1% Mixed Commercial / Residential (e.g. Kiwanis Lodge and Seniors’ Apartments)
7. Population growth for the city is projected to continue at a rate of 1.5% per year

Water Conservation in the City of Nanaimo

Euan Wilson presented information on the City's water conservation achievements and ambitions:

- The city prepared its first water conservation strategy in 2008, which included:
 - Target of 15% reduction in per capita flow (to 510 litres/person/day) by 2035
 - This target was met in 2010 (503 litres/person/day) and 2011 (484 litres/person/day)
 - Plan to educate the public and reduce leaks
- The City of Nanaimo Strategic Plan (2012- 2015) identified Water as one of 6 strategic priorities, and noted that:
 - A desired outcome is 10% reduction in per capita water use per decade
 - An update of the 2008 water conservation strategy is required
- Numerous water conservation measures have been implemented in the city since the 1980's
- Full-cost pricing was introduced in 1992, leading to in a significant drop in peak day water use
- Full-cost pricing by the City covers all the direct costs of supplying water – however the environmental costs of supplying water are not calculated or charged to customers. The idea of including environmental costs in pricing has been discussed, but a mechanism has not been identified. Perhaps it could mimic the mechanism by which the City and the RDN collect money for carbon reduction projects.
- Water Canada magazine has an excellent article on Guelph and their progressive water conservation programs

Nanaimo's water future – who needs to be involved?

A discussion on who needs to be involved in water conservation efforts yielded the following suggestions:

- Large organizations as role models (e.g. VIU, Woodgrove Mall)
- Public water users demonstrating water efficient behaviour (e.g. schools, parks and rec)
- People of Nanaimo
- Community organizations (e.g. Neighbourhood organizations, environmental groups, service clubs)
- Technology leaders (e.g. iDUS, Economic Development Corporation, Innovation Island, VIU)
- Industry – forums led by industry
- Educators – technical training, school districts
- Business (e.g. Chamber of Commerce)

- BC Hydro
- VIHA as regulator (progressive regulations), and as water user (hospital)
- Federal government funding (e.g. Green Municipal Fund)

Goals and targets – what should we aim for?

A discussion on what the City should be aiming for yielded the following suggestions:

- Ready, Fire, Aim
 - City should begin efforts while specific targets and strategies are being developed
- % treated water to irrigation / toilets
 - City should aim for people to use the right quality of water for the right purpose
 - Rainwater or greywater can be used for irrigation and flushing toilets
- City of Nanaimo strategic plan of 10% reduction per decade

Innovative measures – what are the priorities?

A discussion on how the city can reduce water use yielded the following suggestions:

- Focus on enforcement (e.g. community report hotline)
 - This can be considered a negative measure, and the city may want to focus on more positive ways to encourage water conservation
- Encourage Innovative Planning:
 - – (re)development proposals – require water innovation
 - support average builders
 - target developers, create incentives
- Demonstration –demonstrate innovative approaches for the community
- Focus on outdoor efficiency
- Send notices to high users – friendly letter, suggesting solutions, mentioning leak potential
- Support users to fix leaks through rebate on one high water bill if leak is repaired
- Incentives / rebates – grey water, rainwater, controls
- Long term infrastructure project – grants available
 - Access grants (FCM website)

Appendix B: Community Advisory Group Meeting #2 Report

City of Nanaimo Water Conservation Strategy 2012/2013

Report on Community Advisory Group Workshop #2

Water Conservation in the City of Nanaimo

Date: 4 April 2013

Time: 9:00AM – 12:00

Location: Beban Park Social Centre, Room 8

Purpose: To celebrate the water conservation successes achieved in our city and identify ideas, inspiration, and partnerships to further improve conservation efforts, with a focus on large water users and summer water use.

Discussion Notes:

Participants selected the following six topics for discussion at café tables:

1. Lawns and Gardens
2. Greywater and Rainwater
3. School Competitions
4. Irrigation
5. Timely Information
6. Toilet and Low-flow Rebates

Notes from each of the discussions are presented below, as well as notes from a general conversation and water saving successes.

Water Saving Successes

- City of Nanaimo's My City provides billing information
- City's toilet rebate program was widely advertised, very popular, and people are interested in additional toilets per property
 - Retailers advertising the program should be notified when rebates are running out
 - Retailers were great at promoting the rebate, and can help with education e.g. information on the volumes of water amount of solids moved by specific toilets
- The School District uses 90% of water for irrigation
 - Rain sentinels are used to help time the irrigation
 - Urinals are automatic flush with timing depending on use
- The City sends notices to high water users
- The RDN has grants of \$750/ house for rainwater barrels up to 1000L
- The RDN has a demonstration garden in Qualicum Beach – a celebrity gardener could highlight it
- Irrigation Association of BC has certification courses for irrigation professionals

- Benchmarking water users e.g. schools, could help motivate customers to use less water
- Environmental Club Teachers at schools can reach environmentally minded students
- Some communities charge more for water during the summer – summer surcharge
- Enhanced billing information can encourage people to use less water by comparing them to others
- Best ways to engage young people
 - Go through school principals and environmental clubs
 - Meet directly with students – presentations, field trips

1. Lawns and Gardens

Discussion hosted by Cina Opel from the Vancouver Island Health Authority

Key Insights and Ideas

- Need to appeal to youth directly – they will influence their family / care givers
 - E.g. contests, demo gardens
 - Teach the true cost of water (ecological)
 - Face to face communication
- Golden Lawns concept – “brown is okay” signs on people’s lawns can help to communicate the importance of water conservation (Figure 1)
 - City of Nanaimo can distribute or subsidize
- More planting info is needed
 - e.g. info on the City’s Facebook page from Shaw Green Thumbs Bill Saunderson
- Promote gardening workshops in the Parks and Rec Guide
 - Promote RDN existing workshops
 - Develop more workshops on water efficient gardening
- Implement new-home requirements for rainwater harvesting, low flow fixtures, reduced paving, and increased density (reduced lawns)
 - Work with Home Builders’ Association
 - Limit city development to maintain sustainability



Figure 1: Golden Lawn Sign Examples

- Give rebates for rainwater harvesting
- Increase tree canopy to reduce water consumption
- Reducing water used on lawns and gardens can reduce water consumption at peak times
- Educate people about xeriscaping, efficient irrigation systems, tree canopy impact on water consumption, mulching, drought-resistant plants
- City show leadership by planting trees that hold water
 - E.g. along ENR trail
- Perform commercial building water use audits e.g. NRGH
- Increase watering restrictions, from every 2nd day watering to every 3rd day
- Encourage people to visit demonstration gardens for ideas

Next Steps

- Review regulations, by-laws, and education materials

2. Greywater and Rainwater

Discussion hosted by Katelyn McDougall from the Vancouver Island University Students' Union

Key Insights and Ideas

- Greywater and rainwater use takes pressure off City water supply system and wastewater system
- Targeting is important, and scale is important (residential, city-wide)
 - RDN and City could work together on preparing a strategy
- City could provide information about options for homes, schools, businesses
 - Make use of the RDN Rainwater Guidelines
 - Make it easier for residents to implement
- Develop incentives for its use – reasons for people to buy-in
 - Selling feature of a home
 - Reduced taxes
 - Rebates, grants, funding
- It should be voluntary, not required
- Water audits could help identify properties with greatest potential
- Engineered wetlands may be used for larger properties – reproducing nature's filtration system
- Larger rainwater storage units are needed to make it useful for long summers
- Start by focusing on new buildings
- Work with contractors to make it more appealing for customers
- Raw water can be used for field irrigation
- By-laws may need to be passed to encourage greywater / rainwater use, and require it in new buildings
- Official Community Plan should incorporate some ideas to push their uptake
- Centralized rainwater storage could serve dense communities

- Larger institutions can be leaders

Next Steps

- Identify leaders in the community
 - VIU could be an example of Greywater and Rainwater harvesting - first person to talk to would be VIU President Ralph Nielson
- Develop a communications strategy that simplifies the process of using greywater and rainwater and outlines the possible uses of the water, building awareness and knowledge
- Target new buildings and contractors

3. School Competitions

Discussion hosted by Emma Dunbar from the Woodlands Secondary School Environmental Club

Key Insights and Ideas

- A competition between secondary schools to create the most water-efficient demonstration garden on the school property
 - Students have limited influence over the amount of water used inside a school, and outdoor water use is the biggest for school properties
- They will serve as examples around the City for residents, using local plants, edible plants, and water efficient design (no-watering - xeriscaping)
- Sponsors could include NALT, landscape designers, Shaw TV, local nurseries, and Permaculture BC
- Fundraisers could be held, and grants could be applied for
- Students could receive community hours towards graduation for working on the gardens
- Winning garden could be awarded a pizza lunch, trophies, and/or computers
- Tours of the gardens could be hosted through Team WaterSmart
- Food could be grown and donated to a food bank
- See Wellington Secondary School's green wall
- School website could link to environmental issues
- Gardens could be fed by rainwater from the roofs

Next Steps

- The Principles need to be contacted first, then student BC Hydro Energy Ambassadors for each school

4. Irrigation

Discussion hosted by Kimberley Robson with the City of Nanaimo Billing Department

Key Insights and Ideas

- Billing Department can tell immediately if a home has an irrigation system because of how much water is used
- Team WaterSmart provides personal home irrigation audits, identifying the top 10 things to change for more efficient irrigation. Homeowners can request a visit to the house for tips and comparisons.
- There is a rebate offered by the RDN for irrigational professionals to become certified in how to install and program efficient systems, including sprinkler heads and controllers
- The RDN provides rain gauges free of charge
- A water bill rebate could be offered to residents who don't "spike" - minimal difference between winter and summer use (e.g. 10% or less difference)
- Reducing the timing of zones helps reduce water use
- Time of day affects the amount of water lost to evaporation
- Long-term savings by reducing stress on water infrastructure in water consumption decreases
- Higher water rates in the summer could encourage water conservation

Next Steps

- Enhance City's communication strategy - community outreach would help to change behaviour
- The RDN and the City should partner on incentives and projects – set a meeting to sit together and discuss cooperation

5. Timely Information

Discussion hosted by Chad Dalrymple with School District 68

Key Insights and Ideas

- Water users receive bills only once every 4 months, and several months after the end of the billing period, meaning the information is up to 7 months old when they receive it
- Daily, weekly or monthly billing would allow active management of water use, especially for institutions like School District 68, which could then report to students on how successful they are at reducing water use at their school
- It would also help identify water leaks earlier
- More frequent billing would require more frequent meter reading, and radio-read meters with a fleet vehicle to collect data.
- Communication with occupants and students about why water conservation is important will be critical
 - share facts and stats about water use, comparing users and institutions
 - show the bigger picture E.g. dams, taxes, 50-yr strategy

Next Steps

- Workshops for students and a field trip to the water reservoir would engage students in the need for water conservation

- Radio-read meters could be installed on institutions like schools first, and then phased in as meters have to be replaced across the city.

6. Toilet and Low-flow Rebates

Discussion hosted by Bill Sims with the City of Nanaimo Water Resources Department

Key Insights and Ideas

- Toilet rebate program has been very popular
 - Expand to institutional, perhaps with a lesser rebate / toilet
 - Up-front commitment / grant
 - Direct communication
 - E.g. multi-unit apartment building, NRGH
 - Remove 2-toilet restriction from residential
 - Large commercial clients should be excluded from the program
 - Separate allocations can be made to different end users (e.g. 50K residential, 50K multi-family)
- Rebates for smaller low-flow fixtures are also possible, but benefits harder to confirm (e.g. showerheads, faucets, washing machines, sensor faucets)
 - Washing machine rebate could be done in partnership with BC Hydro
- The RDN cistern program could be supplemented by the City
- Rainwater sensors could be rebated
- Partnerships could be made for custom projects
 - E.g. The Nanaimo Regional General Hospital could divert used dialysis water to irrigation with some incentives / grants
- School presentations, enrichment days and school newsletters can teach young people why it's important to conserve water
- Partners: RDN, BC Hydro, retailers (outreach with brochures)
 - BC Hydro can share experience with grant programs e.g. administration
 - Chris Hannah, retired BC Outreach (Bill McCracken has info)
- Water billing in steps, taking account of subsistence needs
- It's all about "valuing water" – need to intensify education and make use of potential technological benefits
- Quicker alerts to users whose water use has increased will catch leaks faster
- Support for steam condensate recovery?

Participants:

There were 28 participants at the event, including representatives from:

- Vancouver Island University Students' Union
- Regional District of Nanaimo
- City of Nanaimo Billing, Water Resources, Building Inspections, and Community Planning Departments
- School District 68 Management

- Woodlands Secondary School Environmental Club
- Welling Secondary School Environmental Club
- Vancouver Island Health Authority
- Nanaimo Regional General Hospital
- Energy Solutions for Vancouver Island

Agenda Followed:

Time Start	Description	Notes
8:15	Room set-up	Tables and chairs, tea and cookies, flip-charts and pens, pamphlets and name tags
8:50	Arrivals	Name tags, tea and cookies, sit at tables
9:10	Welcome – Bill Sims	Welcome, thanks for coming. Today we are sharing successes and generating ideas for how we can achieve even more.
9:15	Introduction, City Successes - Euan Wilson	Water conservation is important in our region, for reducing the stress on our water system and on our environment. Summer water use is much higher than winter water use. The City uses less water than the average across BC, Canada, and the Capital Regional District. We have numerous water conservation measures already in place, including the toilet rebate program, which has been very successful.
9:25	Inspiration – Katherine Trajan	The City is considering what more we can do to reduce summer water use. These are some of the ideas we have come up with.
9:30	Community successes and inspiration	Participants shared stories of successes they have had/seen/heard about in relation to water conservation, and ideas they have for how to reduce water use in the community.
9:55	Initiatives for discussion	Participants identified initiatives/ideas that they would like to discuss in more detail. 6 topics were selected, one for each café table, and one convener was identified for each topic to stay at the table and take notes during the conversations. The rest of the participants were invited to join the discussion they were most interested in, moving to a new topic between each of the 3 café rounds.
10:05	Café Round 1	Conveners and participants discuss: What is the quest behind the initiative?
10:20	Café Round 2	Conveners and participants discuss: Who needs to be involved? What could make the initiative more complete and possible?
10:40	Café Round 3	Conveners and participants discuss: What am I learning about this initiative? What next steps should be taken, and by who?
11:10	Conveners report back	Conveners shared with the whole group their answers to the two questions: - What key insights did you have? - What are the next steps?
11:30	Meeting end	

Appendix C: Existing and Planned Water Conservation Measures

Table C1. Existing and Planned Measures: USEPA Level 1

Description of Measure	Year Introduced	Year Planned	Lead Department
Universal Metering			
Reservoir #1 Meters (30% of source)	1997		
Water Process Center (70% of source)	1980's-1993		
Universal customer metering	1983		
Ongoing testing and replacement of meters		2013	
Develop a bulk-metering plan		2015	
Investigate benefit of radio meters		2016	
Water Accounting & Loss Control			
Five year range capital plans, \$4 million per year committed to repair and replacement	1990's		
Water supply strategic plan	2007		
Water system audit	2012		
SCADA computerized monitoring	1991		
Public communications hotline	1991		
Regular water system audits		2016	
Costing & Pricing			
Expanded block rating system	1983		
Full cost pricing	1992		
Annual user rate increases for long term capital	2007		
Information & Education			
Website with conservation tips	pre-2008		
Conservation information with water bills	2008		
Mobile billboards for sprinkling regulations	2008		
In-school presentations	2008		
School tours of City water system	2008		
Team Water-Smart (with RDN)	2008		
Water Conservation Strategy Workshops	2005		
Notices to high water users	2008		
Develop more informative and visual water bill, paper and online (with RDN)		2014	
Support SD68 high school water-efficient demo-site competition (with RDN)		2014	
School trips to water reservoir (with RDN)		2014	
"Golden Lawn" sign campaign (with RDN)		2014	

Table C2. Existing and Planned Measures: USEPA Level 2

Description of Measure	Year Introduced	Year Planned	Lead Department
Water Use Audits Develop strategy for large-volume water users		2014	Operations / Water Resources
Pressure Management Investigate night-time pressure management		2014	Operations
Landscape Efficiency Demonstrate efficient landscaping on City sites		2015	Parks and Recreation
Residential irrigation audits, with RDN Team WaterSmart	2009		

Table C3. Existing and Planned Measures: USEPA Level 3

Description of Measure	Year Introduced	Year Planned	Lead Department
Replacements & Promotions Low-flow toilet rebate	2009		
Expanded low-flow toilet rebate		2014 - 2015	
Consider incentives for new developments to use water-efficient building and landscape designs		2014 - 2015	Community and Safety Development
Explore smart-irrigation device rebate		2015	
Further promote rainwater harvesting incentives (Team WaterSmart)		2013	
Investigate appliance retrofit incentives		2015	
Water Reuse & Recycling Provide information to encourage use of grey-water systems		2015	Community and Safety Development
Water-Use Regulation Engineering specifications for construction	1978		
Plumbing & service connection specs bylaw	1989 & 2006		
Seasonal watering restrictions	2003		
All civic buildings over 500m ² to be LEED silver or greater	2010		
Metering required by Subdivision Control Bylaw	1989		
Metering required by Waterworks Regulation Bylaw	2006		
Waterworks Rate Bylaw	2006		
Water Use Restrictions Bylaw	2006		
Align Water Use Restrictions Regionally		2014 - 2015	