# Water Conservation Plan

## Regional District of Nanaimo

REGIONAL DISTRICT OF NANAIMO

Prepared for the Regional District of Nanaimo

by AquaVic Water Solutions Inc.

October 2013

AquaVic™ Water Solutions Inc.

## Regional Partnerships for Water Conservation

This plan was informed by the concurrent water conservation planning work carried out by the City of Nanaimo. This joint activity provided a broader view of water conservation objectives and approaches, which benefitted both organizations. The collaboration also supported the need to consider a broad regional context when developing water conservation strategies. As this plan moves forward it will be important to create opportunities to continue to work in regional partnership with all of the member municipalities in the development of water conservation strategies.

## Executive Summary

While water seems abundant on Vancouver Island, long dry summers put pressure on local water resources right when water demand is at its highest. The Regional District of Nanaimo (RDN) is committed to protecting drinking water supplies and water resources in the region, in part through the 2007 Drinking Water & Watershed Protection program (DWWP). One action within the DWWP is the creation of a water conservation plan. While the RDN began working with residents to conserve water as early as 1986, this document presents the first strategic water conservation plan for the Regional District of Nanaimo Water Service Areas.

The RDN operates eight Water Service Areas (WSAs), within which it supplies water to residents, businesses, and community sites such as parks and schools. The RDN aims to show leadership in the WSAs that it manages, while working closely with other water providers in the region and developing water conservation measures that benefit the region as a whole. This water conservation plan reports on the water use trends and goals for the WSAs, focusing on these areas that the RDN monitors and manages directly.

The largest WSA operated by the RDN is the Nanoose Bay Peninsula Water Service Area with just over 2,000 residential connections; the smallest is Decourcey Water Service Area with only 5 connections. The WSAs serve an estimated total population of 6,250 residents, with Nanoose Bay Peninsula and Englishman River WSAs still actively growing, and the other WSAs mostly developed. Population predictions for the region as a whole forecast a significant increase in water demand.

Most of the water supplied to the WSAs is delivered to residences. The average residential water use across the WSAs over the previous five years was 294 litres per person per day (l/p/d). This is significantly less than the average residential water use across British Columbia (353 l/p/d), and 20 litres higher than the average across Canada (274 l/p/d). Summer water use is more than double winter water use, indicating the significant impact of outdoor water use on residential demand. Average summer and winter residential water use has been decreasing across most of the WSAs since 2007, suggesting that residents are reducing the amount of water they use in the household and outdoors. Englishman River and Decourcey are the only two WSAs showing increasing summer water use per household, which may be due to larger, landscaped lots.

The amount of water used during the driest month of each year fluctuates significantly, as it is highly responsive to the amount of precipitation locally (i.e. when there is more precipitation, less outdoor watering is required). Summers are expected to become drier in the Nanaimo region as a result of climate change, which could lead to increasing outdoor water use during summer months when water demand is already at its highest.

Approximately one quarter of the water leaving the WSAs in 2011 was unmetered. This fraction is comprised of water that may be leaving the system through unmetered service connections (e.g. pump stations), during maintenance of the supply system (e.g. flushing water mains), and through minor leaks. Unmetered water use ranged from a low of 9% in Surfside and French Creek WSAs, to a high of 37% in Melrose Terrace WSA. The high proportion of unmetered water in Melrose Terrace is attributed partially to a continuous backwash treatment system serving the WSA.

In all WSAs the greatest reduction in water production can be achieved through residential conservation. Continued reductions in average water use by residential users will likely require additional conservation measures over time as the reductions from existing conservation measures

are realized. In the WSAs where there is significant water use by non-residential metered or unmetered uses (i.e. Nanoose Bay Peninsula, San Pareil and Melrose Terrace), reducing non-residential uses of water would also contribute to a significant reduction in water production over time.

Two ambitious targets have been set for water conservation across the eight WSAs:

1. **Reduce average residential water use by 33% between 2004 and 2018 (*Innovative Options and Opportunities for Sustainable Water Use, 2008)*; and**
2. **Maintain maximum month water production at or below 2004 levels until 2018 (*RDN Water Conservation Plan, 2013*).**

The RDN has moved more than halfway towards the first target already, with a 20% reduction in average water use per household since 2004. This puts the RDN on track to meet the first target by 2018. The second target is recommended because summer is the most ecologically sensitive time of the year, and it is when water use is highest. Maintaining maximum water production at 2004 levels is a prudent target for reducing negative impact on local water resources.

This report has identified a number of measures to add to the suite of existing water conservation activities during the period of 2014 – 2016. These measures will continue progress towards the water use targets in the Water Service Areas, and support water conservation across the RDN as a whole. They include:

(1) Run a “golden lawns” campaign;
(2) Offer an outdoor water efficiency rebate;
(3) Enhance water billing information;
(4) Expand Team WaterSmart activities; and
(5) Prepare Grey-water Guidelines.

For the successful implementation of this water conservation plan, this report recommends strengthening and continuing regional partnerships, focusing some activities on select Water Service Areas, additional monitoring of water use, and periodically reviewing water use trends and the water conservation plan.

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## Please Note

The information presented in this document was compiled for the purposes stated in this document, and with the understanding that each user accepts full responsibility for the use and application of the document and the information it contains. This document and the information it contains are intended only as a general guide. It is not intended to replace the services of experienced specialists where these services are warranted by specific circumstances.

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# 1. Introduction

Water is a finite resource, and it is critical for the health of all ecosystems and human communities. The Regional District of Nanaimo (RDN) recognizes the value of the region's natural water resources, and the need to ensure a continuing reliable and safe supply of water for all residents. While the RDN began working with residents to conserve water as early as the 1980's, this document presents the first strategic Water Conservation Plan for the Regional District of Nanaimo. As part of a broader water management program it provides the necessary information and framework to support successful long-term planning and implementation of water conservation initiatives. This plan focuses on the Water Service Areas (WSAs) managed by the RDN, while considering the broader RDN area and outlining actions that support water conservation throughout the region.

## 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 (2008)* outlines provincial policies and positions that encourage the careful management of water across the province.

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 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 in British Columbia is owned by the Crown on behalf of the residents of the province. Authority to divert and use surface water is obtained by a license or approval in accordance with the statutory requirements of the *Water Act* and the *Water Protection Act*, which are administered by the Water Stewardship Division of the Ministry of Environment. Groundwater extraction is not regulated in the Province of British Columbia.

## Water Conservation in the Regional District of Nanaimo

Water is recognized by residents of the RDN as a precious and vulnerable resource; citizens are interested in maintaining ecosystem values and ensuring that water supplies are safe and sufficient into the future. While water supply may seem abundant in the region, long dry summers put pressure on local water resources at the same time water use is at its highest. In public consultation meetings on water management held by the RDN in 2010, strong themes included the desire to ensure groundwater levels are not decreasing, maintain good water quality of both surface water and groundwater, and ensure aquatic ecosystems are not damaged by human water use.

> *"We think of coastal BC as having an abundant, if not overabundant supply of water. However, trends in increasing population and changing climate mean that demands and pressures are also increasing and changing. The quantity and quality of our water resources are directly impacted by human activity including the amount we use on a daily basis."*
>
> - Regional District of Nanaimo website

The RDN is committed to protecting both water supplies and water resources in the region. The RDN Drinking Water & Watershed Protection Program (DWWP) Action Plan was prepared by the Drinking Water-Watershed Protection Stewardship Committee in 2006/07 and includes a program on Water Use Management. The first action outlined in that program is the creation of water conservation plans for service areas operated by the RDN.

The RDN has had bylaws in place prohibiting the waste of water since 1986, and has introduced additional water conservation measures since then. In 2008 HB Lanarc Consultants prepared a report for the RDN, *Innovative Options and Opportunities for Sustainable Water Use*, outlining possibilities for reducing high summer water use. This has helped guide the RDN's most recent water conservation activities.

Water conservation planning is being done in parallel with work to improve understanding of the natural constraints to water supply in the region. The development of regional water budgets has begun to create a picture of regional water supply and demand, while the Water Use Reporting Centre Tool, which is being piloted in 2013, will allow real-time online water use reporting. In 2010 the RDN consulted with local technical experts and the public to gather information on the local water resources, which has informed the work carried out in this report. Information gathered during the consultation process is summarized in the *Watershed Snapshot Report 2010*. The consultation included three community workshops and yielded community mapping and details on water related issues, concerns, threats, opportunities, information gaps and sources, and vulnerabilities.

## Water Suppliers

Depending on where they live, residents within the RDN may receive water from any of a number of suppliers, or they may provide their own water through domestic wells. There are over 200 organizations within the RDN that manage the treatment and delivery of potable water. These include municipalities, improvement districts, private water utilities and private water systems (systems that serve 2 or more connections or a public facility such as a restaurant). These water supply types are listed in Figure 1.1.

The RDN only manages water supply for the eight WSAs, serving a total population of about 6,250 residents. The RDN works collaboratively with the member municipalities to conserve water across the region. For example, all four municipalities take part in the Team WaterSmart initiative for region-wide outreach and education on water conservation and watershed protection, which was created under the RDN's Drinking Water and Watershed Protection program. Other joint initiatives with the member municipalities include the delivery of an Irrigation Industry Association of BC "Certified Irrigation Technician" course, a collaborative surface water monitoring program, joint education initiatives, and an irrigation system check-up program.

To support water conservation activities in other, non-municipal water supply systems in the region, the RDN also hosted a workshop in 2012 on water conservation planning for small water supply systems. Collaboration between the RDN and other water suppliers in the region will continue to be an important part of the RDN's regional water management efforts.

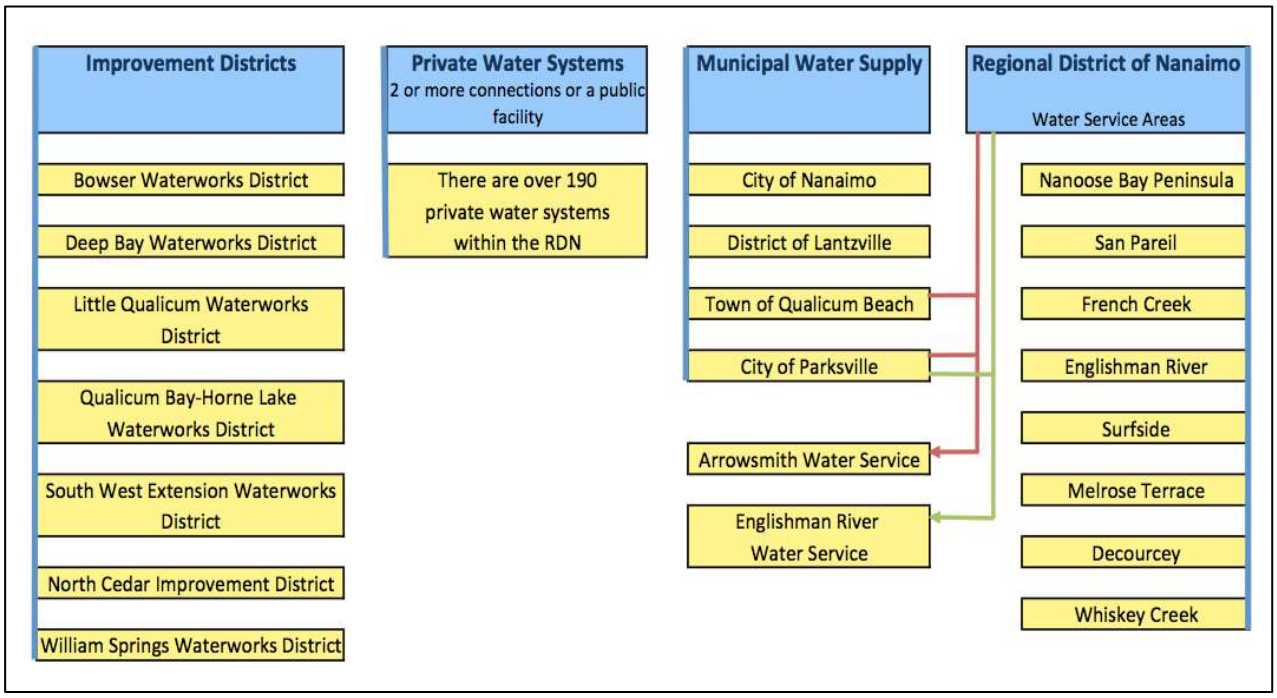


**Figure 1.1. Water Supply Systems within the RDN**

## Water Conservation Planning Framework

Water conservation planning is a cyclical process, requiring review and elaboration of plans as information becomes available, situations change, and conservation measures that have been implemented are evaluated for their success. Each time the planning process is carried out more detail can be added to the conservation plan as more information becomes available.

Both the *USEPA Water Conservation Plan Guidelines (1998)* and the *Water Conservation Planning Guide for British Columbia's Communities (Wong et al. 2009)* from the University of Victoria's POLIS Project have informed the planning framework used in the development of the RDN water conservation plan. The planning process outlined in the *Water Conservation Planning Guide for British Columbia's Communities* is summarized in Figure 1.2 and is reflected by the outline of this document, which summarizes the progress that has been made by the RDN on each step of the planning process.

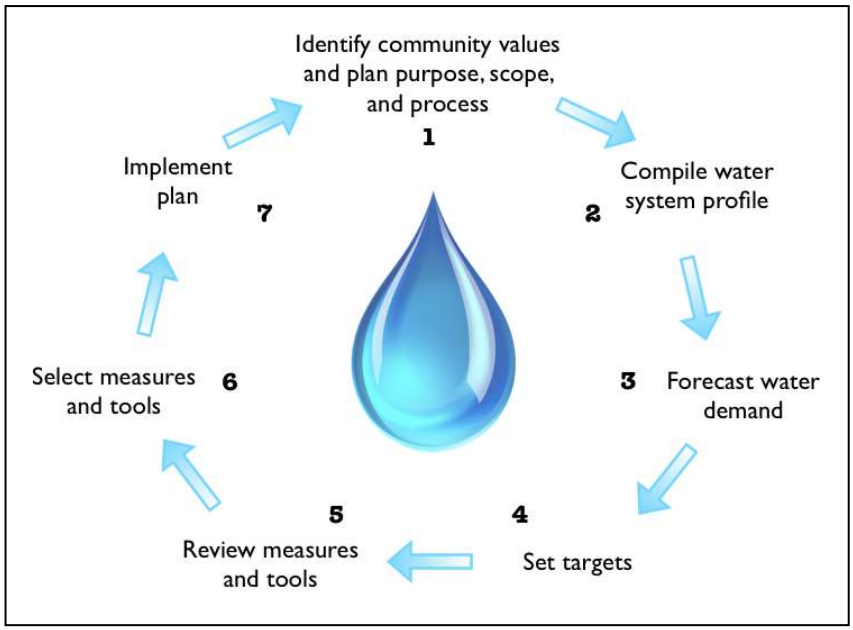


**Figure 1.2. Water Conservation Planning Process (after Wong et al. 2009)**

This plan also draws on principles of the Soft Path for Water – an approach described by Oliver Brandes of POLIS and David Brooks of Friends of the Earth Canada (2007). The planning approach focuses on providing water-related services, rather than supplying ever-increasing volumes of water. Acknowledging that human activities impact the natural environment, the RDN is committed to ensuring that limited resources are used wisely, protecting water resources today and for the future. To support this, the RDN has recently completed a conceptual water budget to increase understanding of regional water supply and demand. This conservation plan aims to encourage sustainable water use, decrease seasonal water deficits and protect the natural environment.

# 2. Profiles of Water Service Areas

Together the Water Service Areas (WSAs) operated by the RDN total just under 2,800 residential connections and serve an estimated total population of 6,250 people. The average residential water use across the WSAs over the previous five years was 294 litres per person per day. This is significantly less than the average residential water use reported across BC in 2009, and 20 litres higher than the average across Canada in 2009.

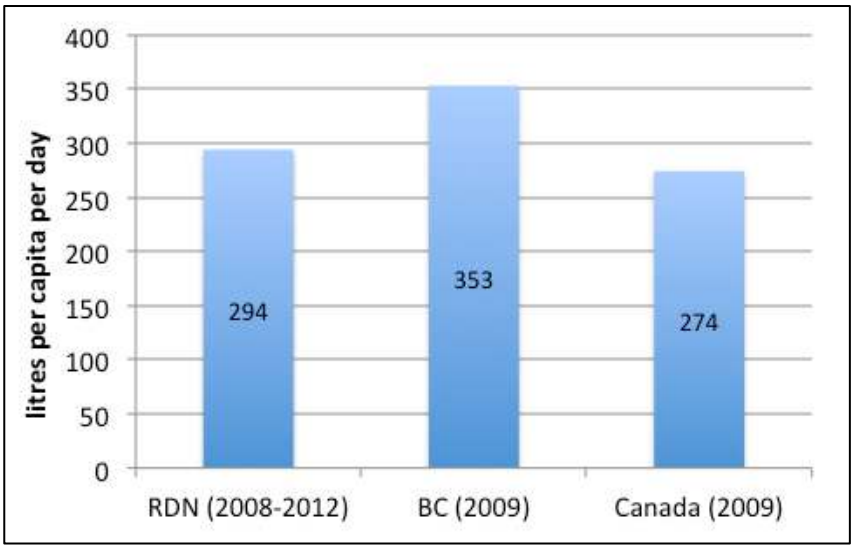


**Figure 2.1. Residential Water Use Comparison**

Source: BC and Canada - 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics (Environment Canada)

Seven of the RDN Water Service Areas are in the north end of the regional district, and one is in the south end (Figure 2.2). The largest Water Service Area is the Nanoose Bay Peninsula Water Service Area with just over 2,000 residential connections, and the smallest is Decourcey Water Service Area with only 5 connections. A brief description and map of each WSA is provided below. Section 3 of this document summarizes more information on water use trends in each WSA. Additional information on each WSA can be found on the RDN webpage for WaterSmart Communities, including well production information, water test results, annual reports, water system maps, and emergency response plans[1].

[1] Regional District of Nanaimo, WaterSmart Communities website: http://www.rdn.bc.ca/cms.asp?wpID=879


**Figure 2.2. Water Service Areas in the RDN**

## Nanoose Bay Peninsula Water Service Area

The Nanoose Bay Peninsula Water System is the largest Water Service Area operated by the RDN. It was established in 2005 by amalgamating the water service areas locally known as Madrona, Wall Beach, Driftwood, Nanoose (Beachcomber), Fairwinds, Arbutus Park, and West Bay, all of which existed as independent systems prior to amalgamation. The Nanoose Bay Peninsula Water System currently serves 2,026 single-family homes, 243 condo and mobile home units, 22 commercial customers, and 5 institutional customers including the Canadian Forces Base and Red Gap Elementary School. The Nanoose Bay Peninsula Water Service Area is partially developed, with significant additional residential and commercial development expected.

The water supply originates from eleven groundwater wells located in the area and is supplemented seasonally (as required) with water from the Englishman River through an agreement with the City of Parksville. The water supply is chlorinated and stored in seven reservoirs throughout Nanoose Bay. A new treatment plant filters water from the four wells in the Red Gap area to address aesthetic water quality concerns associated with elevated iron and manganese levels and the presence of ammonia, all of which are naturally occurring in the groundwater.

Over the past 5 years the average water use per single-family home in Nanoose Bay Peninsula during the winter (October through May) was 458 litres per day (L/day). In the summer (June through September) the average water use was 1210 L/day. This results in an average annual water use per household of 711 L/day. This water use is approximately 1% higher than the average across all RDN systems of 704 L/day per household over the same 5 years.

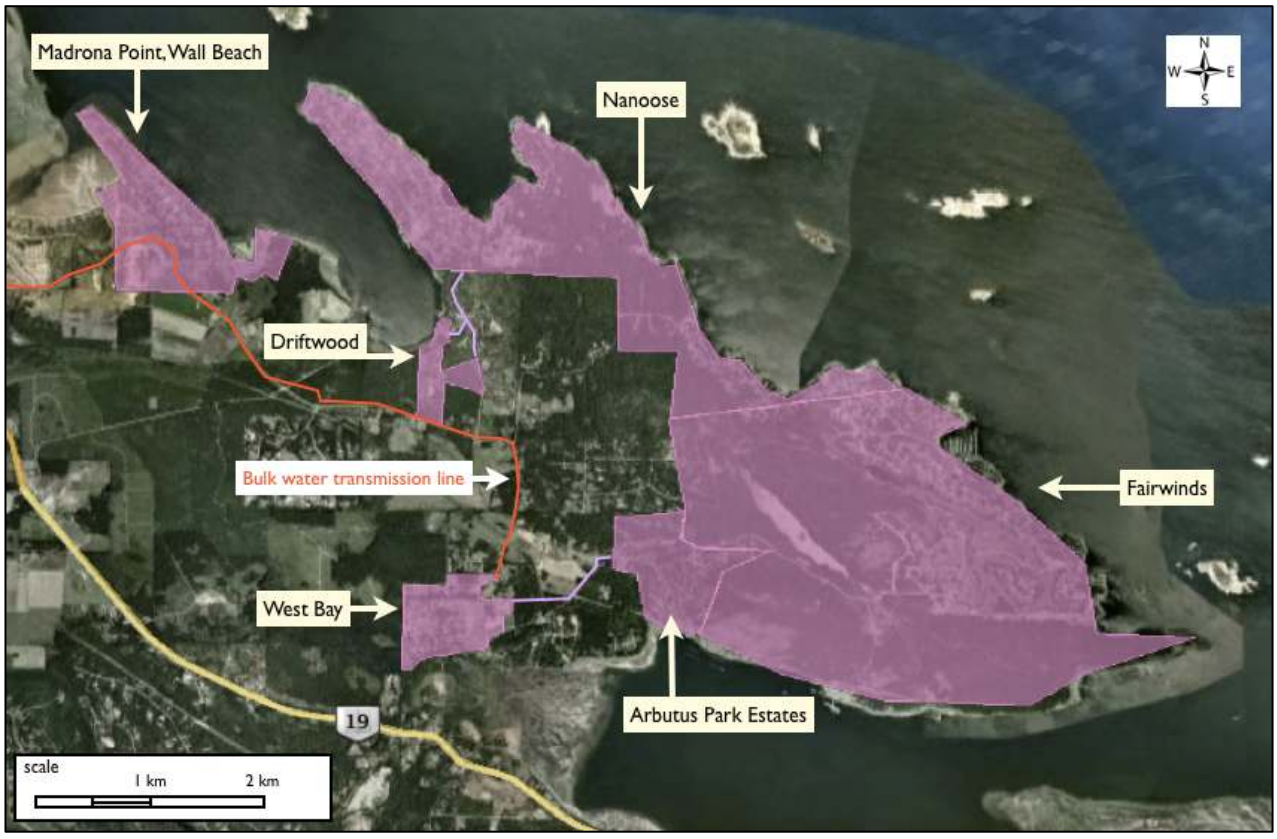


**Figure 2.3. Nanoose Bay Peninsula Water Service Area**

## San Pareil Water Service Area

The San Pareil Water Service Area was established in 1999 when the RDN acquired the existing Bubbling Springs Water Utility. This system is located to the northeast of the Englishman River bridge on the east side of the City of Parksville. There are 279 residential water service connections in San Pareil and the area is almost completely developed according to current zoning. Four groundwater wells located in the well field on Plummer Road serve the system; two of the wells are currently in use, and two are monitoring wells. The water source is chlorinated and stored in one reservoir. Water system upgrades have been approved by residents and the RDN Board. The improvements will upgrade the reservoir, some distribution piping and the pump house to provide flows that meet requirements for fire fighting purposes. Design and construction activity are underway with completion planned for 2014.


**Figure 2.4. San Pareil Water Service Area**

Over the past 5 years the average water use per single-family home in San Pareil during the winter (October through May) was 492 litres per day (L/day). In the summer (June through September) the average water use was 1016 L/day. Based on these figures, the average annual water use per household is 669 L/day. This water use is approximately 5% less than the RDN system average of 704 L/day per household over the same 5 years.

## French Creek Water Service Area

The French Creek Water Service Area was established in 1980 and comprises an area west of Drew Road and south of the Island Highway between the City of Parksville and the Town of Qualicum Beach. There are 237 residential water service connections in the French Creek Water System and the area is completely developed according to current zoning. Water is supplied from six groundwater wells nearby. Of the six production wells three are in use while the other three are not being used due to low production and/or high levels of iron and manganese. The water is chlorinated and stored in one reservoir. In the event of a

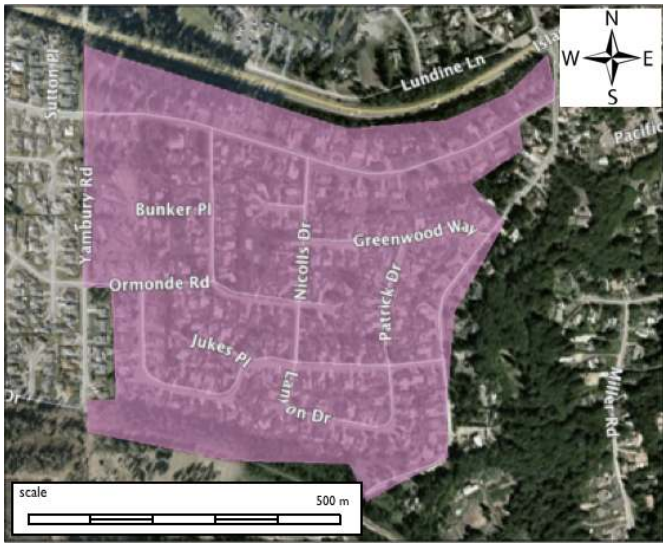


**Figure 2.5. French Creek Water Service Area**

power failure or water system emergency the Town of Qualicum Beach provides back-up water supply.

Over the past 5 years the average water use per single-family home in French Creek during the winter (October through May) was 500 litres per day (L/day). In the summer (June through September) the average water use was 1042 L/day. Based on these figures, the average annual water use per household is 683 L/day. This water use is approximately 3% less than the RDN system average of 704 L/day per household over the same 5 years.

## Englishman River Water Service Area

The Englishman River Water Service Area was established in 2003 and comprises an area near the southern boundary of the City of Parksville between the Island Highway and the Englishman River. There are currently 133 residential water service connections in the Englishman River Water Service Area, which is zoned for a total of 152 individual homes. Water is supplied from four groundwater wells located nearby. The water source is chlorinated and stored in one reservoir.

Over the past 5 years the average water use per single-family home in Englishman River during the winter (October through May) was 592 litres per day (L/day). In the summer (June through September) the average water use was 1858 L/day. Based on these figures, the average annual water use per household is 1019 L/day. This water use is approximately 45% greater than the RDN system average of 704 L/day per household over the same 5 years. Larger lot sizes with significant landscaped areas contribute to the higher water use seen in this WSA.

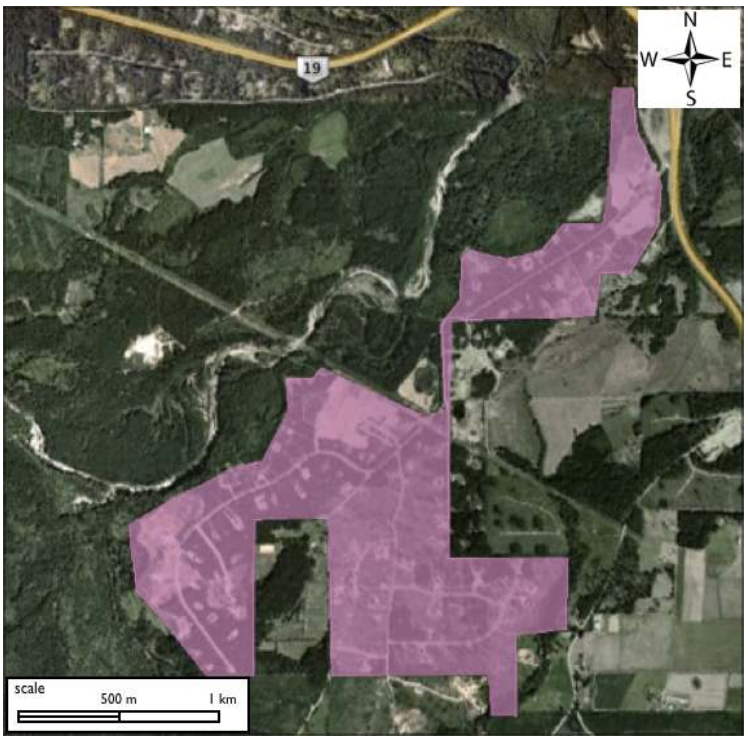


**Figure 2.5. Englishman River Water Service Area**

## Surfside Water Service Area

The Surfside Water Service Area was established in 1986 and comprises an area northwest of Qualicum Beach on Surfside Drive and part of McFeely Drive. There are 37 water service connections in the Surfside Water Service Area and the area is completely developed according to current zoning. Water is supplied from two groundwater wells located nearby, which show signs of potential saltwater intrusion. The water source is chlorinated and is not stored in a reservoir, but is pumped into the system on demand via two pressure tanks. A back-up generator is present at the pump house, should it be required.

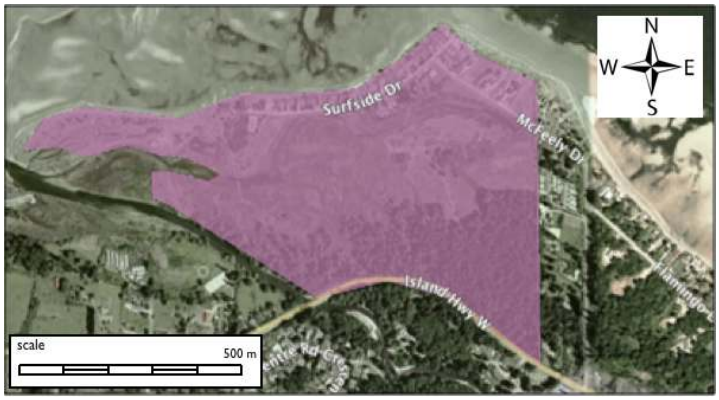


Figure 2.6. Surfside Water Service Area

Over the past 5 years the average water use per single-family home in Surfside during the winter (October through May) was 444 litres per day (L/day). In the summer (June through September) the average water use was 1400 L/day. Based on these figures, the average annual water use per household is 766 L/day. This water use is approximately 9% greater than the RDN system average of 704 L/day per household over the same 5 years.

## Melrose Terrace Water Service Area

The Melrose Terrace Water Service Area was established in April 2005 when the RDN acquired the existing Melrose Terrace Strata Plan VIS3747 water system. The water service area is comprised of 28 residential properties on Melrose Road located near the Alberni Highway, 8 km west of Coombs. The water service area is completely built-out according to current zoning. Water is supplied from one groundwater well located nearby. The water is hyper-chlorinated for treatment purposes and stored in a single reservoir. The water is then filtered through sand and charcoal filters before being re-chlorinated and entering the distribution system.

Over the past 4 years the average water use per single-family home in Melrose Terrace during the winter (October through May) was 454 litres per day (L/day). In the summer (June through September) the average water use was 630 L/day. Based on these figures, the average annual water use per household is 513 L/day. This water use is approximately 27% less than the RDN system average of 704 L/day per household over the past 5 years. The smaller lots sizes contribute to lower outdoor use, and the mobile homes may indicate smaller family sizes, contributing to the lower water use seen in this system.

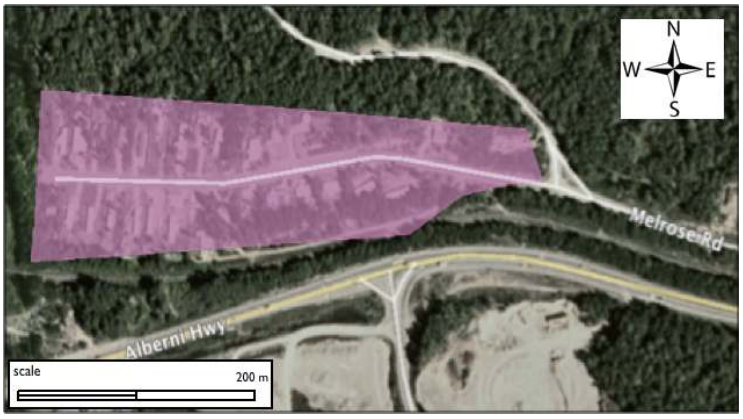


Figure 2.7. Melrose Terrace Water Service Area

## Decourcey Water Service Area

The Decourcey Water Service Area was established in 1998 in a rural area south of Nanaimo, and comprises two properties on Bissel Road and three properties on Pylades Drive. The area is completely built-out according to current zoning. The water source for the Decourcey Water Service Area comes from one groundwater well located nearby. The water source is manually chlorinated and stored in one reservoir. (The conductivity and chloride levels in the Decourcey water system are

generally increasing year to year. The well shows signs of saltwater intrusion and year-round water conservation is being encouraged in order to reduce or reverse the potential for saltwater intrusion.

Over the past 5 years the average water use per single-family home in Decourcey during the winter (October through May) was 362 litres per day (L/day). In the summer (June through September) the average water use was 1098 L/day. Based on these figures, the average annual water use per household is 610 L/day. This water use is approximately 13% less than the RDN system average of 704 L/day per household over the same 5 years. The Decourcey annual average is lower than the RDN average due to the low winter water use, reflecting seasonal occupation in this area (fewer residents through the winter).


**Figure 2.8. Decourcey Water Service Area**

## Whiskey Creek Water Service Area

The Whiskey Creek Water District was acquired by the RDN in January 2011. It was constructed in the 1970s and initially operated by the subdivision developer, Westerlea Estates Ltd. The water system supplies the Westerlea Estates Subdivision, located eight kilometres southwest of Qualicum Beach on the south side of Highway 4. There are 123 residential lots connected to the water system and the area is completely built-out according to current zoning. Two licences allow water to be drawn from nearby Crocker Creek. The water supply is filtered, chlorinated, and stored in one reservoir. An emergency backup generator is available in the event of a power failure.

Information gathered from the previous water system operators indicates that several complaints and inquiries were received from the Whiskey Creek water service area in 2010, and were typically related to colour, and/or chlorine taste and odours in the water.

Residential water meters were installed in 2011. The average water use per single-family home in Whiskey Creek during the winter (October through May) was 340 litres per day (L/day). In the summer (June through September) the average water use was 590 L/day. Based on these figures, the average annual water use per household is 424 L/day. This water use is approximately 40% less than the RDN system average of 704 L/day per household over the last 5 years. Concerns regarding the cost of water once the RDN took over management of the system contributed to reduced water use in 2011.

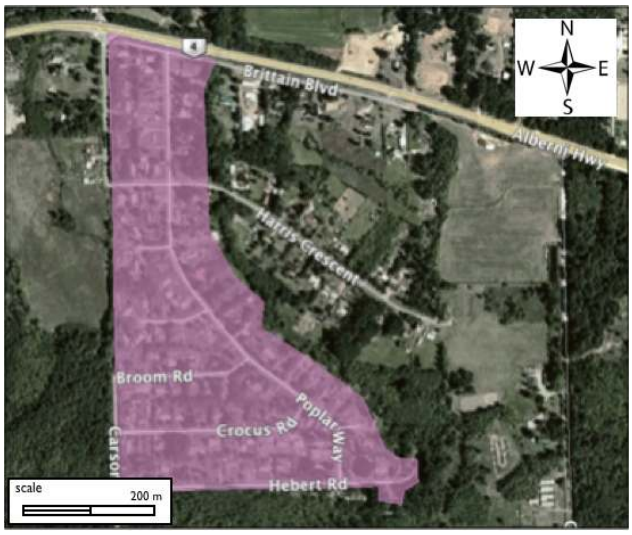


**Figure 2.9. Whiskey Creek Water Service Area**

# 3. Water Use Forecasts

This section presents historical and projected trends for population and water use in the Regional District of Nanaimo.

## Population Projections

The population of the RDN has increased steadily over the past thirty years (Figure 3.1). Within this time frame the average annual growth rate has ranged between approximately 0.6% and 4.9%.

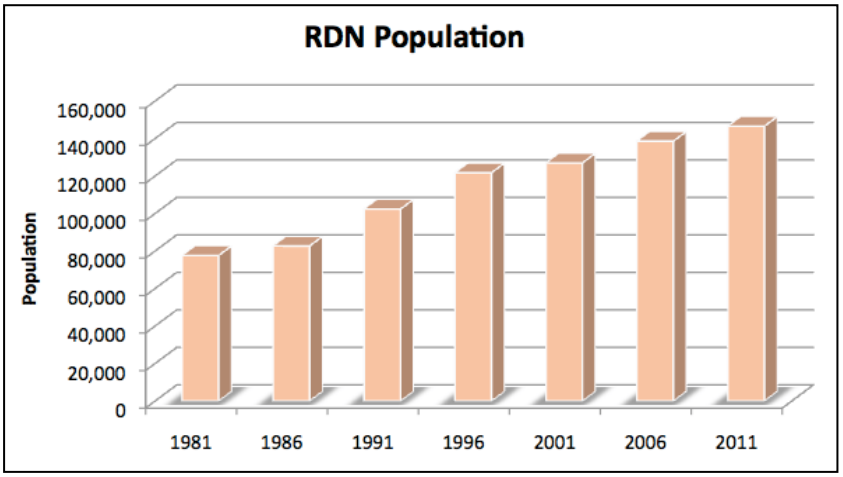


**Figure 3.1. RDN Population 1981 to 2011**

Across the Water Service Areas (WSAs) the average annual increase in the number of residential connections between 2007 and 2011 was 1.7% (Table 3.1) New connections since 2007 have predominantly been in Nanoose Bay Peninsula and Englishman River; there is active development in these two water service areas with zoning for additional homes on currently undeveloped lots. The other WSAs have been almost fully developed according to zoning as of 2011. In these WSAs the number of service connections are expected to remain stable. Average population per single-family home in the RDN has decreased from 2.4 people per unit 25 years ago to approximately 2.3 people per unit today, and is expected to be 2.2 people per unit for future development in the RDN. Population in the fully-built WSAs is thus expected to remain at existing levels or see a slight decline.

**Table 3.1. Residential Service Connections**

| Water Service Area | Residential Service Connections | | | | | Average Annual Increase (%) |
|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2010 | 2011 | |
| Nanoose Bay Peninsula* | 1,874 | 1,899 | 1,926 | 1,975 | 2,014 | 1.8 |
| San Pareil | 276 | 276 | 277 | 278 | 279 | 0.3 |
| French Creek | 233 | 233 | 234 | 235 | 237 | 0.4 |
| Englishman River | 101 | 109 | 118 | 126 | 133 | 7.1 |
| Surfside | 38 | 38 | 37 | 37 | 37 | - 0.7 |
| Melrose Terrace | 28 | 28 | 28 | 28 | 28 | 0 |
| Decourcey | 4 | 4 | 4 | 5 | 5 | 6.3 |
| **Total Connections** | **2,554** | **2,587** | **2,624** | **2,684** | **2,733** | **1.7** |

Note: * Condos and mobile home park service connections are not included

The Urban Futures 2007 report *Population and Housing Change in the Nanaimo Region, 2006 to 2036* predicts a 60 percent increase in RDN population, from 144,317 residents in 2006 to 231,184 in 2036 (an average annual increase of 1.6%). This forecast aligns closely with the growth in connections in the Water Service Areas since 2007.

Koers and Associates Engineering Ltd. estimated residential, commercial, and institutional growth expected within the existing Nanoose Bay Peninsula Water Service Area in a draft Development Cost Charges study performed in 2012. This study forecast development according to zoning in the RDN Official Community Plan, and a summary is provided in Table 3.2. Overall population is expected to approximately double by 2045 with most residences being multi-family residences such as mobile homes and condos. Residential development is anticipated primarily in the Lakes District and the Schooner Cove areas. Over five times the current commercial space is planned by 2045, located in the Red Gap Village Centre, Schooner Cove Neighbourhood Centre and the Lakes District. Institutional redevelopment is expected for the Nanoose Bay Elementary School and the creation of a Lakehouse Centre. No industrial development is planned. The report notes that the 2% growth rate experienced in the water service area recently may be expected to continue until the area is built-out.

**Table 3.2. Development Projection for Nanoose Bay Peninsula Water Service Area**

| Nanoose Bay Peninsula Water Service Area | 2011 | 2031 projection | | 2046 projection (built-out) | |
|---|---|---|---|---|---|
| | units | units | % increase from 2011 | units | % increase from 2011 |
| Single family residences | 2010 | 2785 | 39% | 3177 | 58% |
| Multi-family residences | 243 | 633 | 160% | 1474 | 507% |
| Congregate care units | 0 | 25 | -- | 50 | -- |
| Commercial floor space ($m^2$) | 2900 | 12,025 | 315% | 15,625 | 439% |
| Institutional floor space ($m^2$) | 6213 | 17,733 | 185% | 17,733 | 185% |
| Population | 5085 | -- | -- | 10,000 | 97% |

As shown in Tables 3.1 and 3.2, population growth will not be evenly distributed across the RDN or the WSAs. Nanoose Bay Peninsula and Englishman River will experience increasing demands on their water supply systems while the other WSAs may maintain a steady number of connections. This means that annual water stress related to the natural seasonal variation in water supply (i.e. summer dry periods due to lack of recharge) will be largely compounded in areas of increased development while water stress may remain the same in other locations. The impact on groundwater resources of increased population in Nanoose will be mitigated by the use of surface water through the current agreement for supply from the City of Parksville and future supply via the Englishman River Water Service Joint Venture.

## Historical Water Production and Use

The RDN meters water flow throughout each WSA, including customer water connections, in order to monitor and evaluate system performance and bill for water use. The total amount of water that flows into a water system is referred to as the ***water production*** of the system – it includes all the water pumped from supply wells and any bulk water that is supplied from outside the system. This water that enters the system can then be divided into a number of ***water uses***, which describe the final destination of the water as it leaves the system.

Most water leaving the RDN systems is residential water use – water that is delivered to residential customers. Water use data in the RDN is collected in two sets: single family residences and all other connections. ***Single family residential water use*** refers to water delivered to detached homes on single lots; these meters are read twice a year, at the end of May and the end of September. Data for all other connections is collected every quarter, at the end of March, June, September and December. These connections have been divided into four categories: ***multi-family residential, commercial, institutional, and services***. Nanoose Bay Peninsula provides water to all of these types of uses. Englishman River and San Pareil each have one commercial connection and are otherwise residential. The remainder of the WSAs are exclusively residential.

### Types of Water Use

**Single family residential -** *water delivered to detached homes on single lots*

**Multi-family residential -** *water delivered to other residences, including condos and mobile home parks*

**Commercial -** *water delivered to commercial customers, such as Fairwinds Golf Club and Quality Foods Plaza*

**Institutional -** *water delivered to institutions, such as Red Gap Elementary School and the Canadian Forces Base*

**Services -** *water used by public services including fire lines, pump stations, and irrigation for public landscaping*

**Unmetered -** *water that leaves the system without being metered, including water used to flush water mains, water theft through unauthorized connections, fire department use, and minor leaks.*

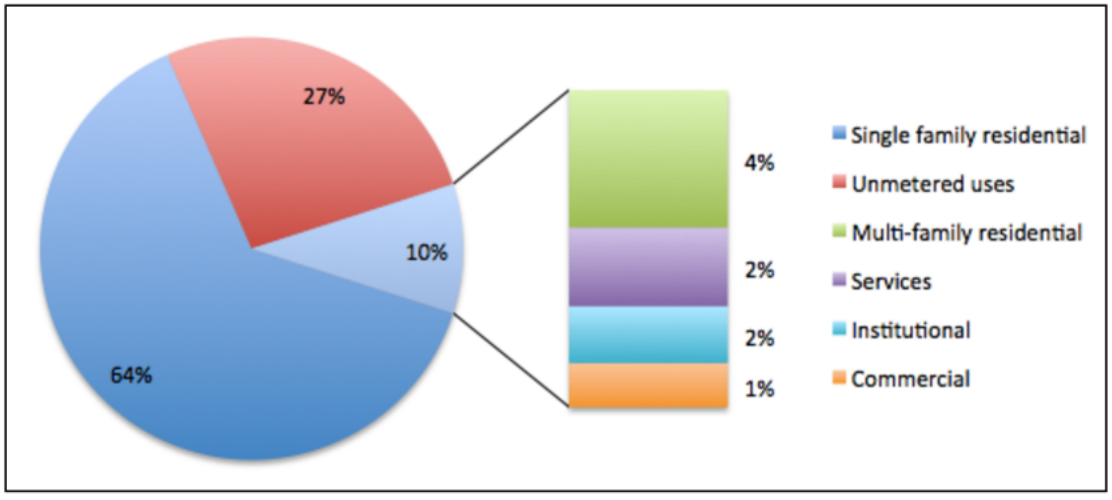


**Figure 3.2. 2011 Water Use by Category Across All RDN Systems**
Note: Whiskey Creek not included, due to metering commencing midway through 2011

In addition to metered water uses, water may also leave the system unmetered – this is called ***unmetered water use*** and includes both authorized (e.g. maintenance flushing of water mains) and unauthorized (e.g. theft of water and minor leaks) uses of water. Data is not available to quantify these two components of unmetered water at this time.

## Current Water Use

Water use by all WSAs (with the exception of Whiskey Creek) in 2011 is shown in Figure 3.2 divided into the categories described above. The majority of water that entered the systems was delivered to single-family residential homes, 10% of all water was delivered to other metered users, and 27% of water leaving the system was unmetered. The proportion of water unmetered in each WSA is shown in Table 3.3. The large proportion of unmetered water use in San Pareil is attributed to a pumping station serving the system that uses water to cool the pumps. A continuous backwash treatment system in Melrose Terrace contributes to the high unmetered water use in that system.

**Table 3.3. Unmetered Water Use[2]**

| Water Service Area | % of 2011 Total Water Use Unmetered |
|---|---|
| Nanoose Bay Peninsula | 28% |
| San Pareil | 35% |
| French Creek | 9% |
| Englishman River | 19% |
| Surfside | 9% |
| Melrose Terrace | 37% |
| Decourcey | 16% |

Water audit studies performed in 2006 identified unaccounted water losses of 15% in Nanoose Bay Peninsula and 3% in French Creek. Repairs made in Nanoose since 2006 have resulted in leakage reduced to 9% in the Nanoose Bay Peninsula and negligible in Decourcey and Surfside. With relatively low leakage, the high volume of unmetered water use in 2011 may be primarily attributed to system maintenance such as flushing water mains, backwashing treatment systems, and water consuming pumping stations. Identifying and metering the primary system maintenance uses of water would assist in managing these components of water use and calculating system losses.

Comparing water use between the WSAs shows significant differences in average water use. Figure 3.3 shows the average water use by single-family residences in the winter and summer over the past five years for each WSA. Table 3.4 summarizes the data for Figure 3.3. Englishman River and Surfside stand out with significantly higher summer water use than the other WSAs, while Melrose Terrace has significantly lower summer use than any other WSA. The larger lot sizes with significant landscaping contribute to the high summer water use in Englishman River and Surfside. Conversely, the smaller lots in Melrose Terrace contribute to the lower summer water use in that system.

[2] Figures for Whiskey Creek are not included in this table because residential water meters were installed in the Whiskey Creek WSA part way through 2011.

The differences in winter water use are not as large, with Englishman River using the most water per connection and Decourcey using the least. Water conservation may be required in some service areas more than others to address high summer water use.

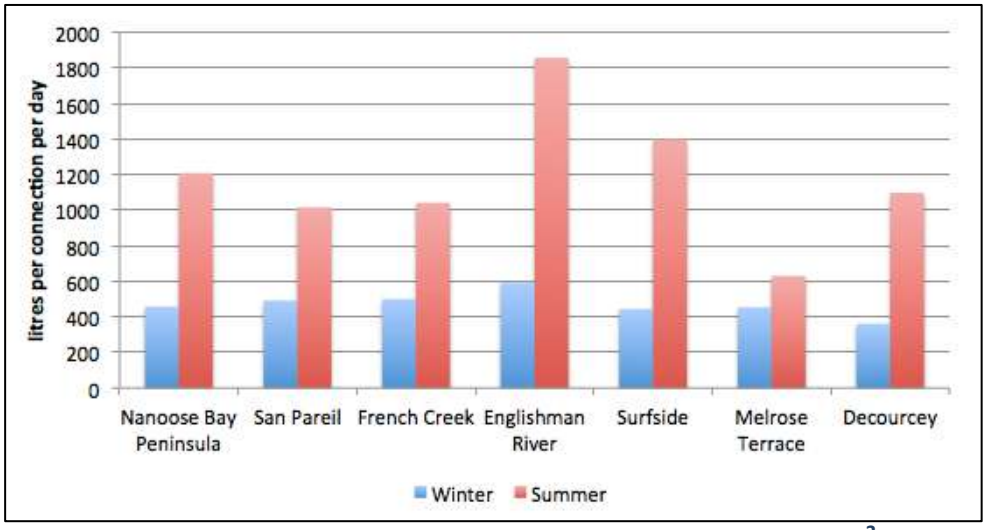


**Figure 3.3. Average Single-Family Water Use 2008 – 2012[3]**

Note: This figure does not include data for condos and mobile home parks in Nanoose Bay Peninsula

**Table 3.4. Average Single Family Water Use 2008 – 2012[3]**

| Water Service Area | Average Single-Family Water Use (litres per connection per day) | | | Compared to RDN Annual Average |
|---|---|---|---|---|
| | Winter | Summer | Annual | |
| **Nanoose Bay Peninsula** | 458 | 1210 | 711 | +1% |
| **San Pareil** | 492 | 1016 | 669 | -5% |
| **French Creek** | 500 | 1042 | 683 | -3% |
| **Englishman River** | 592 | 1858 | 1019 | +45% |
| **Surfside** | 444 | 1400 | 766 | +9% |
| **Melrose Terrace** | 454 | 630 | 513 | -27% |
| **Decourcey** | 362 | 1098 | 610 | -13% |

Note: 2008 – 2012 RDN annual average water use was 704 L/connection/day

[3] Figures for Whiskey Creek are not included in this table because residential water meters were installed in the Whiskey Creek WSA part way through 2011.

## Water Use Trends

The total production of all WSAs during the period of 2007 to 2011 and the division of this production into water use categories is shown in Figure 3.4. Annual water production has fluctuated between 1.0 and 1.1 million cubic metres of water over this period and does not show a strong trend. Water use in each category has also fluctuated without strong trends, while single family residential use was at a low in 2011 and other metered uses and unmetered water use were at a high for this time period.

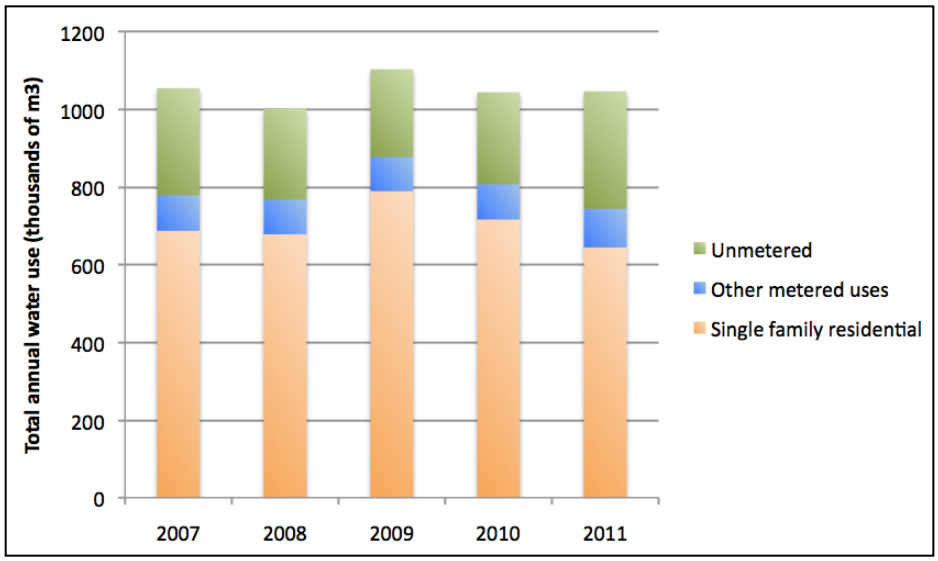


**Figure 3.4. Water Use by Category Across All RDN Systems 2007 – 2011**[4]

Water production for each WSA (except Whiskey Creek, for which historical data is not available) is shown in Appendix A. Nanoose Bay Peninsula, Decourcey and Melrose Terrace have had relatively stable overall production, with Melrose Terrace showing a decreasing trend over 2008 to 2011. French Creek had a significant reduction in production between 2005 and 2007, partly as a result of many residential connections being transferred to the Town of Qualicum Beach water supply system. Englishman River experienced a significant increase between 2005 and 2009 due to new homes built in the water service area. San Pareil has had significant fluctuation in annual system production, showing an overall decreasing trend. Surfside production spiked in 2006 and has since stabilized.

Figure 3.5 shows the average daily water use per single-family residential connection across all RDN service areas during the period of 2007 to 2012. The graph shows average annual water use in green, with a decreasing trend over the period. It also shows average use in winter and summer periods to separate the effects of outdoor water use in the summer (June through September) from the predominantly indoor water use in the longer winter period. The decreasing trends suggest that residents are reducing both the amount of water they use in the household and outdoors. Summer water use is more than double winter water use, showing the significant impact of outdoor water use on residential demand.

[4] Figures for Whiskey Creek are not included in this table because residential water meters were installed in the Whiskey Creek WSA part way through 2011.

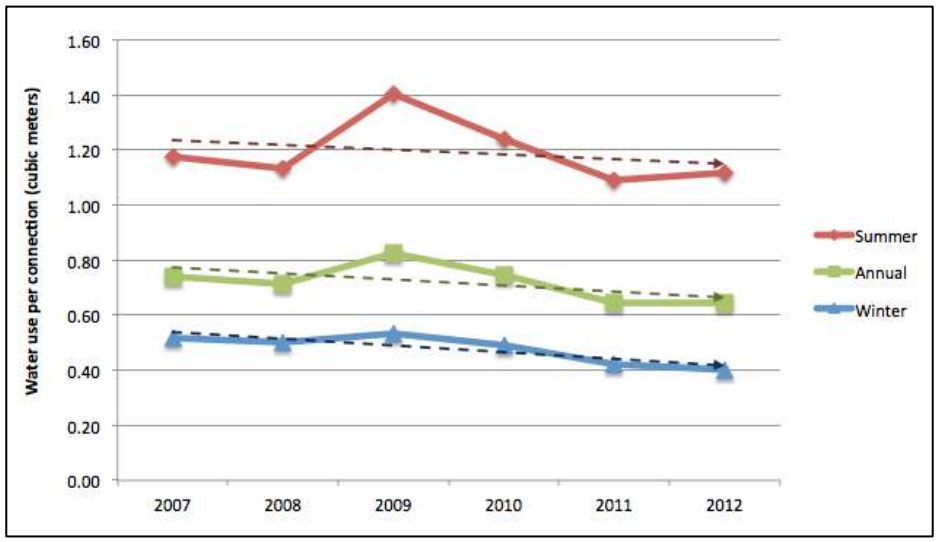


**Figure 3.5. Average Daily Residential Water Use Across All RDN Systems**

Note: -Whiskey Creek is represented in this graph starting in 2012. This figure does not include data for condos and mobile home parks

The trends in winter and summer water use also vary significantly between some WSAs. Figure 3.6 shows average winter and summer water use per single-family household in Nanoose Bay Peninsula over the period of 2007 to 2011. Corresponding charts for the other WSAs are shown in Appendix B.

All WSAs have experienced decreasing winter water use, with the exception of Decourcey. This indicates reduced indoor water use, which may be a result of more water efficient fixtures installed in homes, and of water conserving behavior.

Summer water use has increased in some water service areas, and decreased in others. Changes in summer water use indicate changes in outdoor water use behavior, such as water used for landscaping. San Pareil, French Creek and Melrose Terrace all experienced declines in average summer water use, while Nanoose Bay Peninsula summer use has remained relatively stable and Englishman River and Decourcey have experienced increasing summer water use per household.

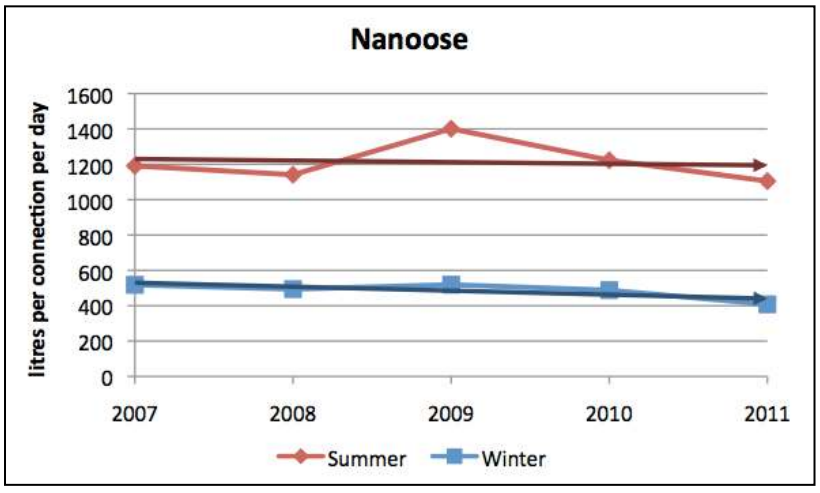


**Figure 3.6. Seasonal Residential Water Use in Nanoose Bay Peninsula**

Note: This figure does not include data for condos and mobile home parks

Melrose Terrace has very similar winter and summer water use, while all other systems have significantly higher water use in the summer than in the winter. This is due to the smaller lot sizes with minimal landscaping in Melrose Terrace.

Review of total system water production over a longer period of time shows how overall water use by the WSAs is changing. Changes in water production are partly due to changes in the population being served, and partly due to changes in water use behaviour by the population. Figure 3.7 illustrates the average daily water production across all WSAs for the period of 2001 to 2012. The graph shows a decrease in annual, winter, and summer water production, with significant fluctuations in summer water production. These declines in overall water production have been achieved even as the number of connections being served in the WSAs has increased.

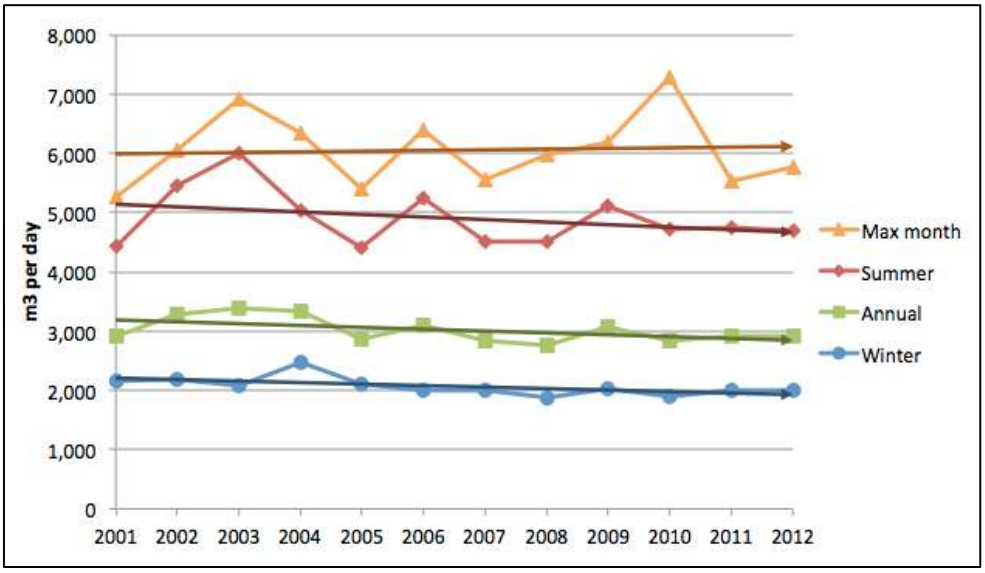


**Figure 3.7. Average Daily Production Across All RDN Systems**

Figure 3.7 also displays the average daily system production during the month with the highest water use each year, referred to as ***max month***, which is typically July or August. As with the summer trend, maximum month production fluctuates significantly, but it displays a slight increasing trend. Water production is more variable in the summer than in the winter due to outdoor water use, which is highly responsive to the amount of precipitation locally (i.e. when there is less precipitation, there is more outdoor water use). The spike in maximum-month production in 2010 corresponds to the month with the lowest precipitation on record over the period of 2001 to 2012. Summers are expected to become drier in the Nanaimo Region as a result of climate change, which could lead to increasing outdoor water use during summer months when water demand is already at its highest.

## Water Use Projections

The information on historical usage may be used as a guide to water use in the future. In each Water Service Area (WSA) water use is predominantly influenced by two factors: the number of service connections and the average water use per connection.

### Number of Connections

The number of connections in all service areas combined has increased at an average rate of 1.7% within recent years. Future growth in the number of connections will be influenced by several factors including trends in the RDN population as a whole, demographic factors such as the aging of the population, and zoning for development in each of the WSAs. Under current zoning all WSAs are fully

built except for Nanoose Bay Peninsula and Englishman River. The projections in this plan are based on the current zoning, and assume that no additional connections will be added in the WSAs that are fully-built. Englishman River is zoned for an additional 17 residential connections. Nanoose Bay Peninsula is zoned for development that anticipates the population to double between 2011 and 2046, from 5085 to 10,000 people. Zoning provides for an additional 1167 single-family residences, 1231 multi-family units, more than five times the current commercial development, and additional institutional development, as detailed in Table 3.2. The planned development in these two WSAs is incorporated in the future water use projections.

### Water Use per Connection

Water use per connection across the WSAs has decreased over the past 5 years. Since 2007 annual residential water use per connection has decreased by over 2.5% per year on average, while summer residential water use per connection has decreased on average by 1% per year. These reductions indicate that reductions in water use have primarily occurred inside the home, and may be a result of both improved water efficiency of fixtures inside the home and more water conscious behaviour by residents with greater water conservation awareness.

Future water use per connection will be influenced both by water conservation measures that encourage further reductions in water use and by changes in climate. Hotter summers with longer dry periods are expected for this region, which may increase summer water use. Projections include scenarios for both constant water use per connection and for a continuing reduction in average water use per connection. A reduction in summer water use of 1% per year for the conservation scenarios was selected to reflect the average reduction achieved across the RDN between 2007 and 2011.

Projections for future water use to 2051 according to three scenarios are shown for each WSA in Figure 3.8 and Appendix C. The projections show ***average daily summer production***, indicating the average volume of water that the system would be required to supply daily throughout the peak water use season. Maximum month production per day has historically been 11% to 54% higher than average summer production, so a significantly higher volume of water than shown in the projections is expected to be required during the peak month of each summer. The three future water use scenarios shown for each Water Service Area are:

- ***Current Water Use*** – average residential water use, other metered water uses and unmetered water remain at 2011 values
- ***Residential Conservation*** – average residential water use is reduced at 1% per year while other metered water uses and unmetered water remain at 2011 values
- ***Community Conservation*** – average residential water use, other metered uses and unmetered water are reduced at 1% per year

Figure 3.8 shows the future water use scenarios for the Nanoose Bay Peninsula Water Service Area. Development is expected to continue in the service area until 2046, which is reflected in the increasing water production across all scenarios. Production in the Current Water Use scenario increases until parcels are developed to full current zoning potential in 2046, while the Residential Conservation and Community Conservation scenarios peak in 2036 due to reductions in average water use per connection. Peak average production is 7300 $m^3$/day under the Current Water Use scenario, 5450 $m^3$/day under Residential Conservation, and 4800 $m^3$/day under Community

Conservation. These represent increases of 97%, 47% and 30% respectively from the 2011 summer average production of 3700 $m^3$/day. Data for the Nanoose Bay Peninsula projection in Figure 3.8 is provided in Appendix D.

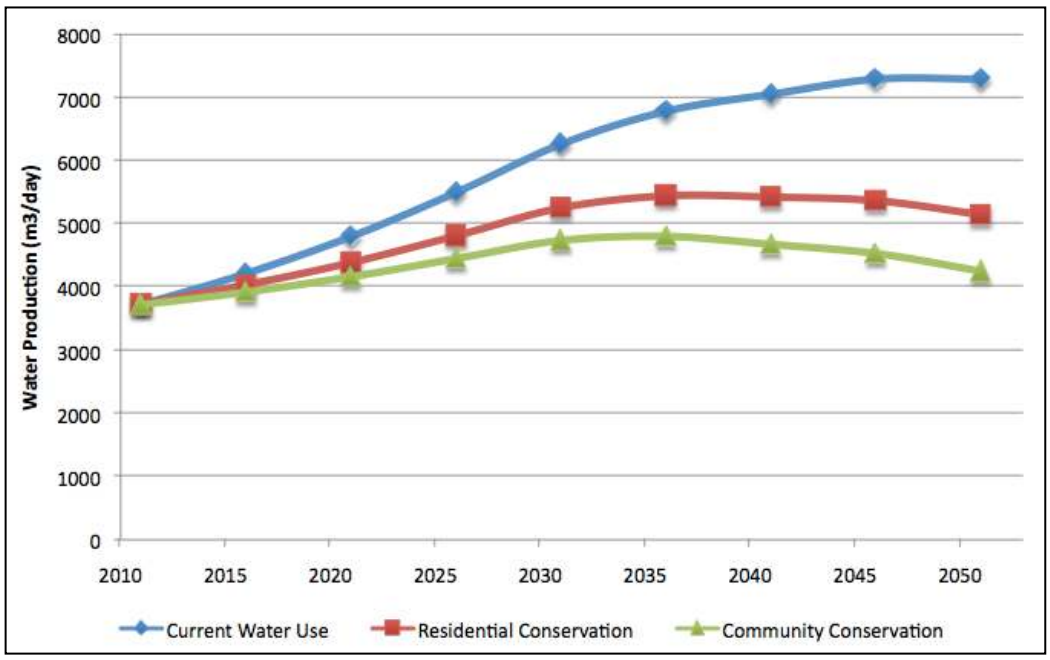


**Figure 3.8. Projected Average Daily Summer Water Production for Nanoose Bay Peninsula**

Projections for the other WSA, with the exception of Englishman River, show steady water use for the Current Water Use scenario, given that they are fully-built and no additional service connections are planned. Englishman River is expected to experience a continued increase in water demand as additional residences are built and then a levelling-off or reduction in water demand. The difference in water production between the Residential Conservation and Community Conservation scenarios depends on the proportion of unmetered water leaving each system (Table 3.3). The proportion of water use that was unmetered in the summer of 2011 has been used for the projections.

Reductions in average water use will require continued conservation measures. Particular emphasis should be placed on the WSAs where there is significant water use by non-residential metered or unmetered uses (i.e. Nanoose Bay Peninsula, San Pareil and Melrose Terrace). Addressing these gaps and encouraging wise water use by all residents will contribute to significant reductions in water production and support the overall protection of water resources.

# 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 objectives for water conservation that help to ensure the desired benefits are achieved.

## Water Conservation Goals

Benefits from water conservation may be divided into three categories: protecting the natural environment; reducing water supply costs; and improving water supply. Goals for water conservation in the RDN are listed in Table 4.1.

**Table 4.1. 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 water wells, reservoirs, treatment facilities, pumping stations and pipelines. |
| 4. Lower variable operating costs, for example energy 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. |

## Water Conservation Targets

Setting targets that are in line with the goals in Table 4.1 requires knowledge of the capacity and characteristics of the water supply sources and delivery systems. Conceptual water budgets for each of the watersheds in the RDN have recently been completed, which inform the selection of targets related to the water supply source. Two targets to minimize strain on local water resources are recommended:

1. **Reduce average residential water use by 33% between 2004 and 2018 (*Innovative Options and Opportunities for Sustainable Water Use, 2008)*; and**
2. **Maintain maximum month water production at or below 2004 levels until 2018 (*RDN Water Conservation Plan, 2013*).**

The 2008 *Innovative Options and Opportunities for Sustainable Water Use* report recommended the target of 33% reduction in average residential use, from 800 litres per day in 2004 to 536 litres per day in 2018. This target was selected to keep overall water use across the RDN steady even with the 49% population increase that is forecast between 2004 and 2030. The RDN has moved more than halfway towards this target already, with a 20% reduction in average water use per household since 2004. As shown in Figure 4.1, the RDN is on track to meet the target of 33% reduction by 2018.

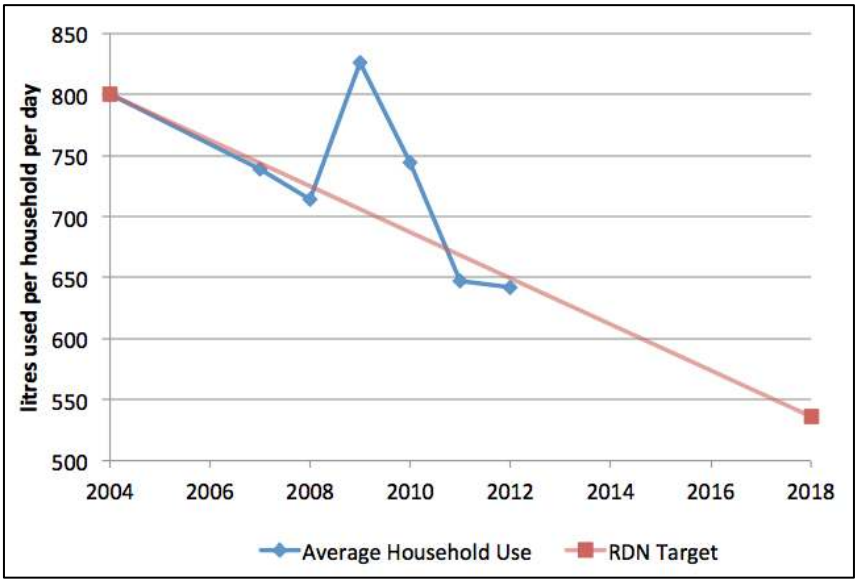


**Figure 4.1. Residential Water Use Target**

A second target is recommended for the total amount of water that is withdrawn from the environment during the summer months. Summer is the most ecologically sensitive time of the year, and it is also when water use is highest. This report recommends a short-term target of maintaining maximum month water production at or below 2004 levels until 2018 (Figure 4.2).

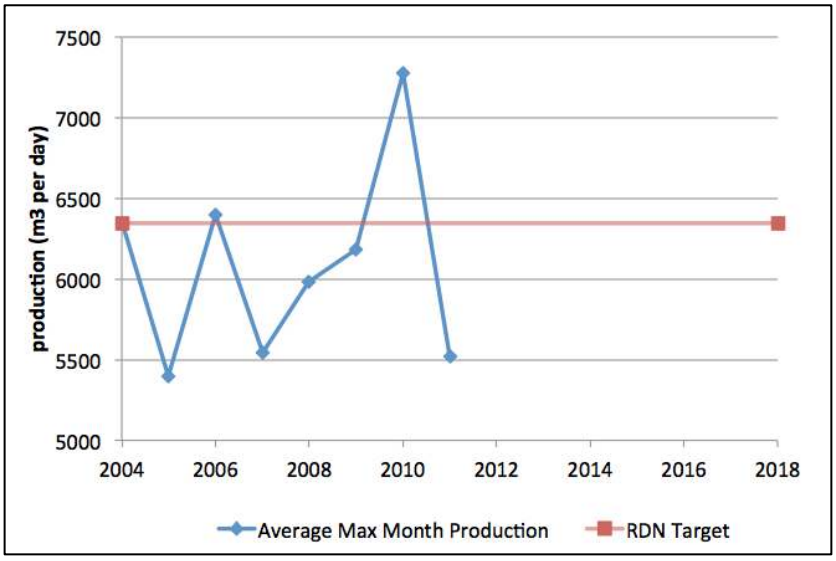


**Figure 4.2. Maximum Month Production Target**

Maximum month water production is highly variable, and very responsive to the amount of precipitation in the month. As increasingly dry summers are anticipated for the region, it may be a challenge to reduce maximum month peaks, such as that experienced in the summer of 2010. Measures focused on outdoor water use will be necessary.

# 5. Water Conservation Measures

This section of the plan outlines some current and potential conservation measures for the RDN.

## Current Water Conservation Measures

The RDN has implemented numerous water conservation measures in the Water Service Areas (WSAs), with bylaws prohibiting wastage of water introduced as early as 1986. The RDN has introduced water conservation measures across all of the WSAs that they manage, and also undertaken water conservation activities across the broader region, such as Team WaterSmart outreach. Table 5.1 shows the water conservation measures carried out by the RDN and the year that they were introduced.

## Potential Conservation Measures

There are many types of measures that can be used to encourage water use reductions, including those referenced by the US Environmental Protection Agency (USEPA). The USEPA Water Conservation Plan Guidelines are organized into three levels as shown in Table 5.1. Level 1 measures are broadly considered the easiest to implement, and Level 3 measures are generally applied in larger water systems. Other measures have been identified through public interaction, including:

**1. Innovative Options Report**

The *Innovative Options and Opportunities for Sustainable Water Use* report (2008) prepared for the RDN by HB Lanarc Consultants provides detailed recommendations for a number of conservation measures, emphasizing the need to reduce peak summer water use. Conservation measures that the report identified as priorities, and actions that the RDN has since taken on these recommendations, are listed in Appendix E.

As described in the report, the basic principles that guide water conservation in the RDN are:

- Use less water through demand side management; and
- Develop alternate water supplies through rainwater harvesting and water reuse.

**2. Suggestions From Residents**

The water conservation priorities identified in the Innovative Options report were reinforced during consultation with RDN residents in 2010 during the preparation of the RDN '*Watershed Snapshot Report 2010*'. During that consultation residents provided the following recommendations regarding water conservation:

1. Continue water conservation outreach activities;
2. Develop and implement a strategy for rainwater reuse;
3. Provide school education programs; and
4. Provide incentives for water conservation practices, both indoor and outdoor.

Community water conservation workshops hosted by the RDN and the City of Nanaimo in April 2013 also generated ideas specific to water conservation measures that would be appropriate for the RDN.

## Table 5.1. Current RDN Water Conservation Measures

| Title of Measure | Description of RDN Measure | Year Implemented |
|---|---|---|
| **USEPA LEVEL 1 MEASURES** | | |
| **Universal Metering** | | |
| Source-water metering | **Metering production wells** | |
| Service-connection metering | **Universal metering** | 1990 |
| **Water Accounting & Loss Control** | | |
| Repair known leaks (residential) | **Refund part of water bill when leak is repaired** | 2006 |
| System audit | **Water system loss review** | 2006 |
| Leak detection & repair strategy | **Letters notify high users of their high water use** | 2007 |
| Water Use Reporting Centre Tool | **Online real-time reporting of water use** | Pilot – 2013<br>Full - 2014 |
| Water Budgets | **Region-wide water resource inventory** | 2013 |
| Agricultural Water Demand Model | **Estimate of agricultural water demand** | 2012 |
| **Costing & Pricing** | | |
| Advanced pricing methods | **Inclining block rates (increasing water rates with increasing use)** | 2007 |
| **Information & Education** | | |
| Information available | **Website with conservation tips; fridge magnets showing watering days, newsletters, RDN publication** | Ongoing |
| School program | **In-school programs, lectures** | 2006 |
| Public education program | **Team WaterSmart** | 2005 |
| Workshops | **Free WaterWise workshops on gardening, rainwater harvesting, and greywater re-use** | 2006 |
| Technical advisory committee | **Drinking Water – Watershed Protection Stewardship Committee** | 2009 |
| **USEPA LEVEL 2 MEASURES** | | |
| **Customer Water Use Audits** | | |
| Outdoor water use audits | **Free irrigation system audits** | 2010 |
| **Outdoor Efficiency** | | |
| Irrigation management | **Watering day patrols** | 2003 |
| **USEPA LEVEL 3 MEASURES** | | |
| **Replacements & Promotions** | | |
| Promotion of new technologies | **Low flush toilet rebates* & promotional materials** | 2010 |
| | **Rainwater Harvesting Incentive program** | Pilot - 2011<br>Full - 2012 |
| **Water-Use Regulation** | | |
| Water-use standards & regulations | **Bylaws prohibiting wastage** | 1986 |
| | **Seasonal watering restrictions** | 2003 |

**Note:** * The toilet rebate program is currently under review after over 1200 rebates

# 6. Priority Measures 2014 - 2016

This report has identified a number of measures to add to the suite of existing water conservation activities during the period of 2014 – 2016. These measures will continue progress towards the water use targets in the Water Service Areas, and support water conservation across the RDN as a whole. The selection of measures has been made in consideration of the commitment under the Drinking Water & Watershed Protection Program (DWWP) to protect drinking water supplies and water resources throughout the region. These measures allow the RDN to make strides on water conservation within the WSAs that it manages while supporting conservation efforts across the RDN. Priority water conservation measures for 2014 – 2016 are described below.

## Conservation Measures

**Priority Measures 2014 - 2016**

(1) Run a "golden lawns" campaign

(2) Offer an outdoor water efficiency rebate

(3) Enhance water billing information

(4) Expand Team WaterSmart activities

(5) Prepare Grey-water Guidelines

**1. Run a "golden lawns" campaign**

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 laws, allowing them to go "golden" during the summer. This campaign may be carried out in collaboration with the City of Nanaimo and other water providers, local habitat and conservation groups, and in conjunction with the Team WaterSmart residential irrigation audits.

**2. Offer an outdoor water efficiency rebate**

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

**3. Enhance water billing information**

Develop a more informative and visual water bill for both online and paper billing. Bills will show information such as 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.

**4. 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. It is recommended that the activities of Team WaterSmart be expanded to include:

- 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 the City water reservoir;
- 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 and a showerhead.

**5. Prepare Grey-Water Guidelines**

As part of the Green Building Series of guidebooks being prepared by the RDN, it is recommended that a guidebook on the design and installation of grey-water systems be created in partnership with the RDN Sustainability Department. The successful *Rainwater Harvesting: Best Practices Guidebook* promotes the use of rainwater harvesting and provides region-specific information needed to design and install a rainwater system. A similar guidebook for grey-water systems will support residents to reduce their water consumption through the installation of grey-water systems in their homes.

# 7. Implementation Strategy

The measures described in this strategy are recommended for implementation over the years 2014 to 2016. Regional District of Nanaimo staff will prepare detailed plans and budgets for the individual measures. The RDN's commitment to protecting water resources throughout the region will guide the implementation of the measures. Taking a holistic view of the pressures on our shared water resources, the RDN will aim to show leadership in the Water Service Areas that it manages, while working closely with other water providers in the region and developing water conservation measures that benefit the region as a whole.

For the successful implementation of the plan, this report recommends that partnerships be strengthened and continued, some activities focus on select Water Service Areas, additional water use monitoring be undertaken, and the plan be periodically reviewed. Each of these elements of the implementation strategy is briefly described below.

## Continue to Build Regional Partnerships

Partnerships with water suppliers and individuals in the region 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 RDN, and they will be important for carrying out the activities. The City of Nanaimo is currently reviewing its water conservation strategy, and the City and the RDN have identified activities that may be undertaken together. This is an important partnership, and the RDN will continue to work with the City of Nanaimo and other water providers to identify select activities that can be delivered in partnership. This report recommends that the RDN 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.

## Focus on Priority Areas

Some activities may be focused or promoted more in specific areas within the RDN or RDN WSAs where summer water use is highest and/or on an increasing trend (i.e. Nanoose Bay Peninsula; Englishman River; Surfside; and Decourcey Water Service Areas), and areas with significant unmetered non-residential water use (i.e. Nanoose Bay Peninsula; San Pareil, and Melrose Terrace). Dependant on the geographic location of priority areas, activities may be undertaken by the RDN, municipalities or other water providers. Where suitable, the RDN may seek to deliver activities in partnership with these groups.

## Additional WSA Monitoring

The RDN meters all residential and commercial connections in WSA systems, as well as the water produced by wells, bulk water brought into the system, water leaving reservoirs, and flow at other points in the water distribution system. Some targeted expansion of monitoring will provide valuable information for the management of water use and the water supply systems. The following additional monitoring is recommended:

### 1. Peak-day production

Identifying production peaks is critical for assessing the demand on the system, determining the sufficiency of system components, and setting targets for peak production. Monitoring daily water production will allow the identification of peak-day production volumes.

**2. System water use**

Metering system water uses that are known to use significant amounts of water (e.g. maintenance activities and the Melrose Terrace treatment plant) will assist in managing this significant component of water use.

**Additional Water Service Area Monitoring**

(1) Peak-day production

(2) System water use

(3) Categories of non-residential water use

**3. Categories of non-residential water use**

Information on how much water is being used by the various non-residential water users, their seasonality, and their trends over time will help target reductions in non-residential water use. Currently all non-residential metered water use in the WSAs is calculated as "commercial", while it includes commercial, institutional, multi-family dwellings, and municipal services. Tracking these components of non-residential water use discretely will allow trends in non-residential water use to be identified.

## Plan Review

Successful water conservation programming requires regular review to ensure it is having the desired effect and to respond to changing conditions. Table 7.1 presents the schedule for reviewing and updating the RDN water conservation plan. The first review is scheduled for 2016, which will provide for an examination of water use trends sufficiently in advance of 2018 to allow for any adjustments to the plan that are necessary to meet the conservation targets for 2018. In 2018 new medium-term targets will be set, and the plan will then be reviewed every four years.

**Table 7.1. Water Conservation Plan Review Schedule**

| Date | Actions |
|---|---|
| 2016 | • Review water conservation targets<br>• Review water use trends and update forecasts<br>• Review conservation measures and select additional measures if needed |
| 2018 | • Set new medium-term conservation targets<br>• Review water use trends and update forecasts<br>• Review and update profiles of water systems<br>• Review conservation measures and select additional measures if needed<br>• Consult with residents on targets and measures |
| 2022 and every 4 years | • Review water use trends and update forecasts<br>• Review conservation measures and select additional measures if needed<br>• Review and update profiles of water systems<br>• Consult with residents on targets and measures |

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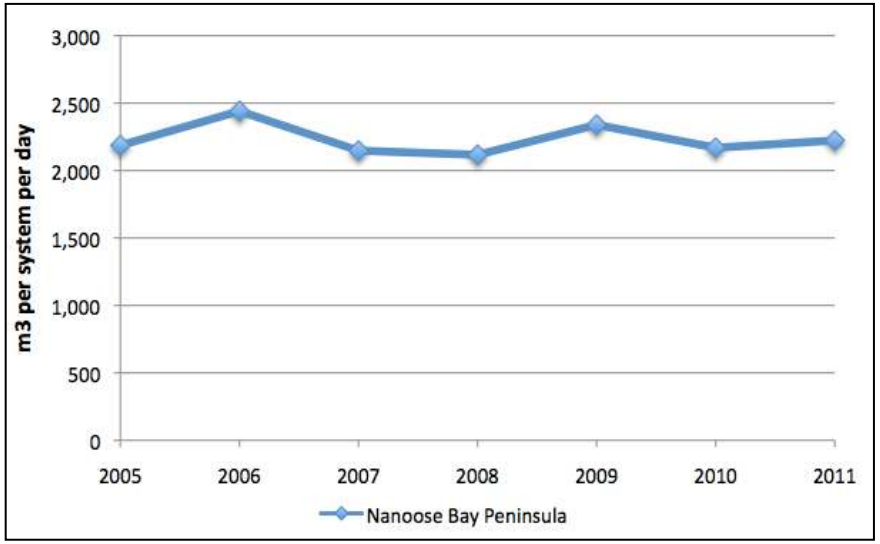
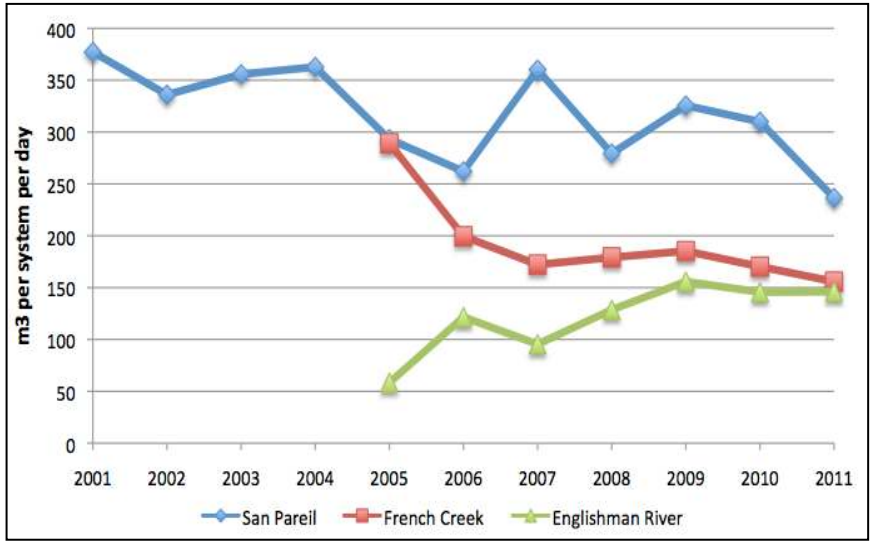
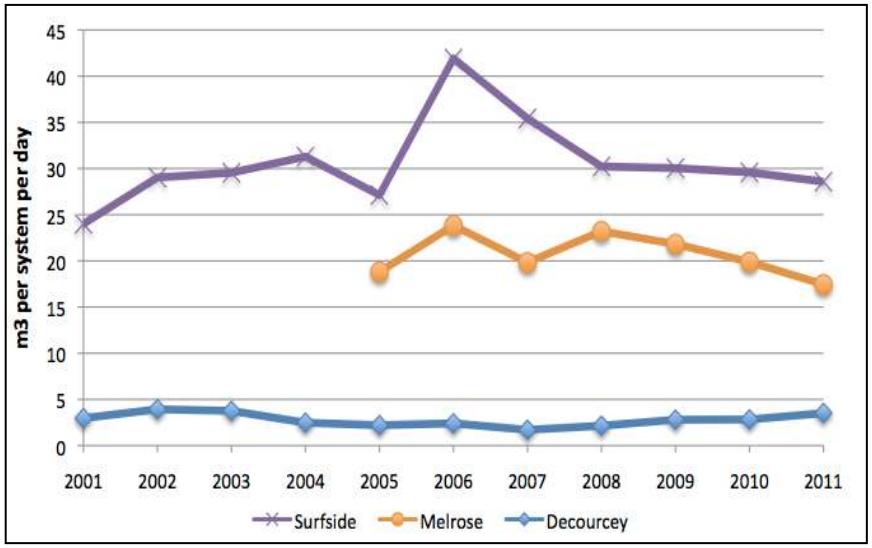
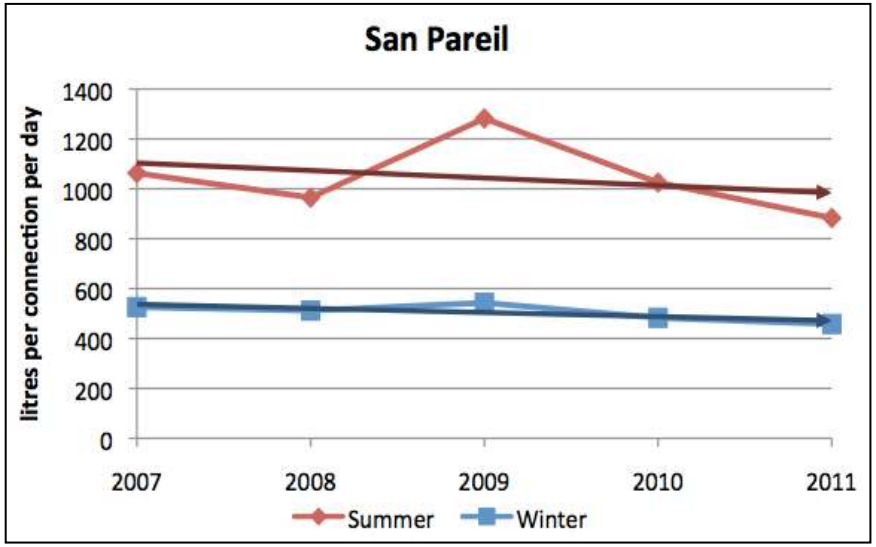
## Appendix A: Average Water Production 2001 - 2011

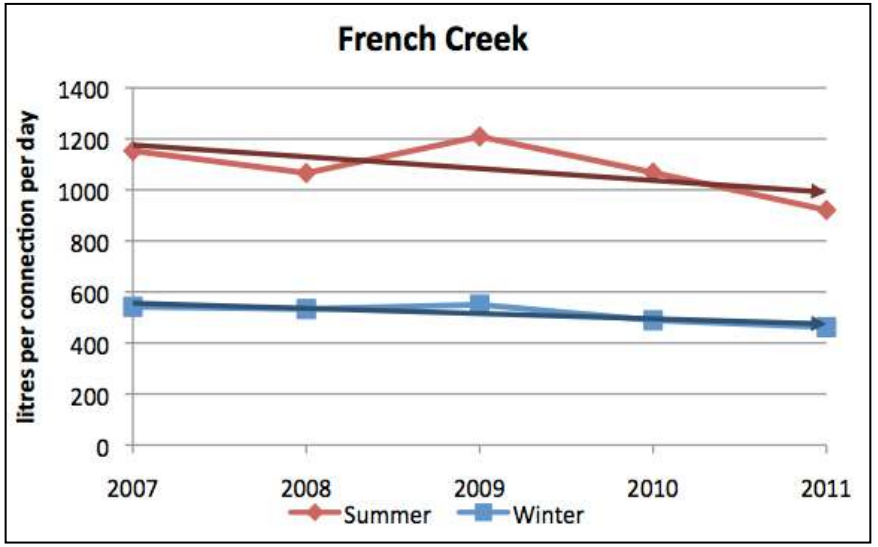


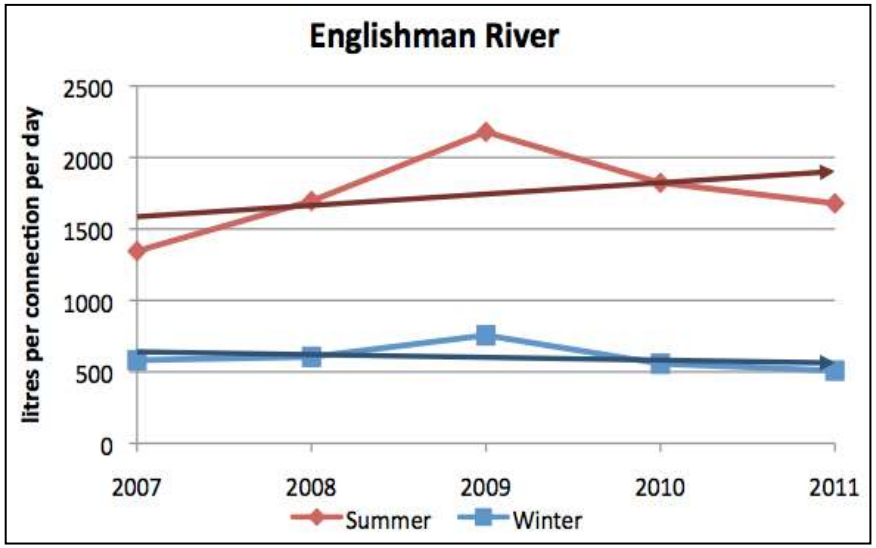



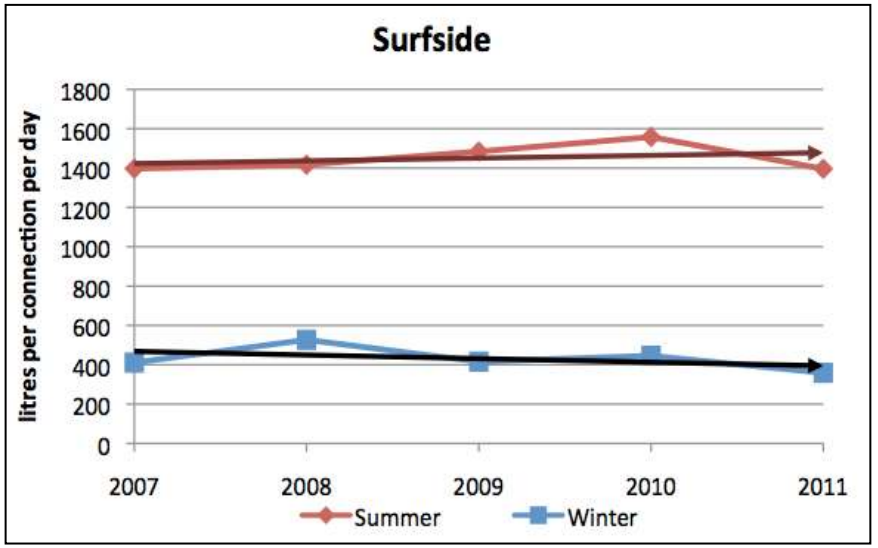



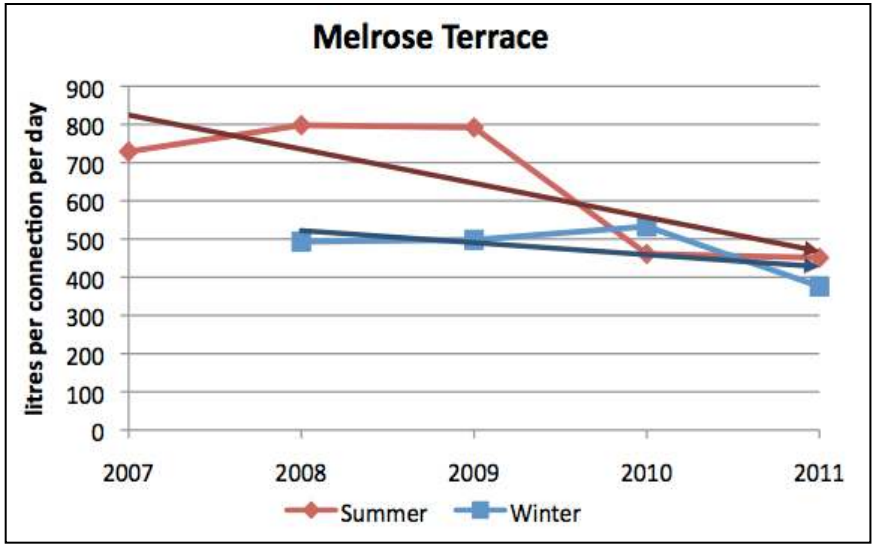
## Appendix B: Average Winter and Summer Residential Water Use

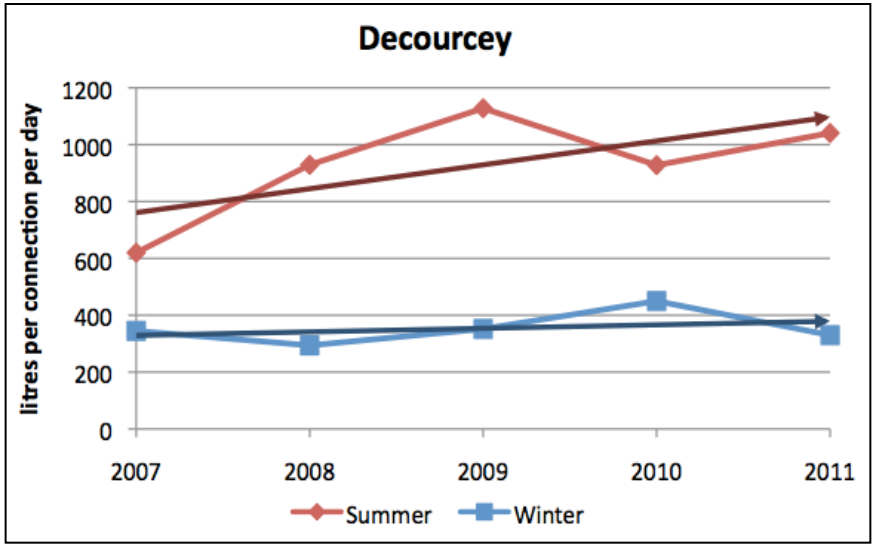



Melrose Terrace
litres per connection per day
900
800
700
600
500
400
300
200
100
0
2007
2008
2009
2010
2011
Summer
Winter

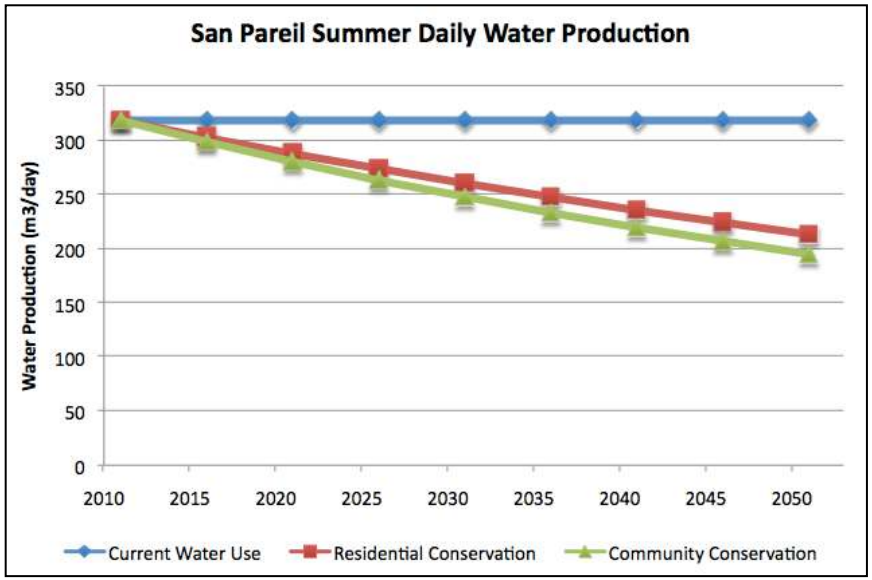

Decourcey
litres per connection per day
1200
1000
800
600
400
200
0
2007
2008
2009
2010
2011
Summer
Winter

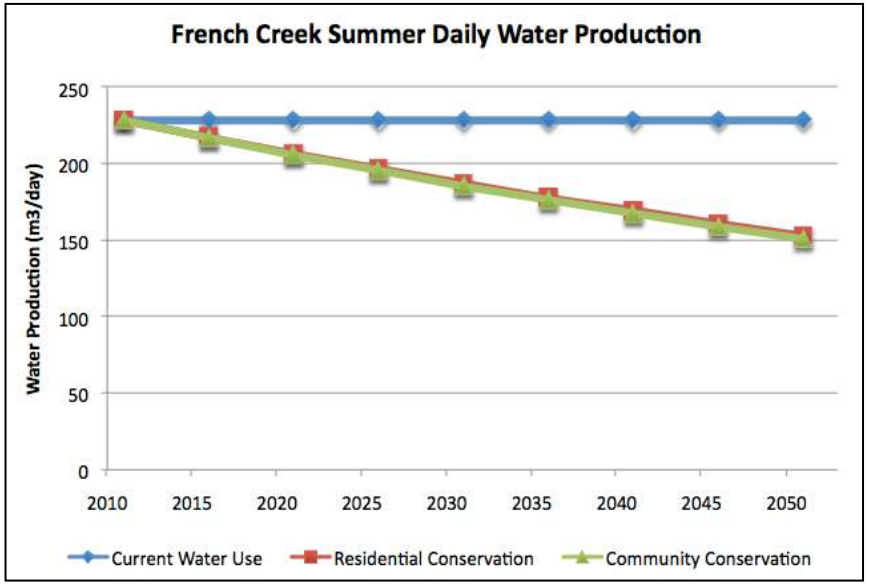
## Appendix C: Water Use Projections

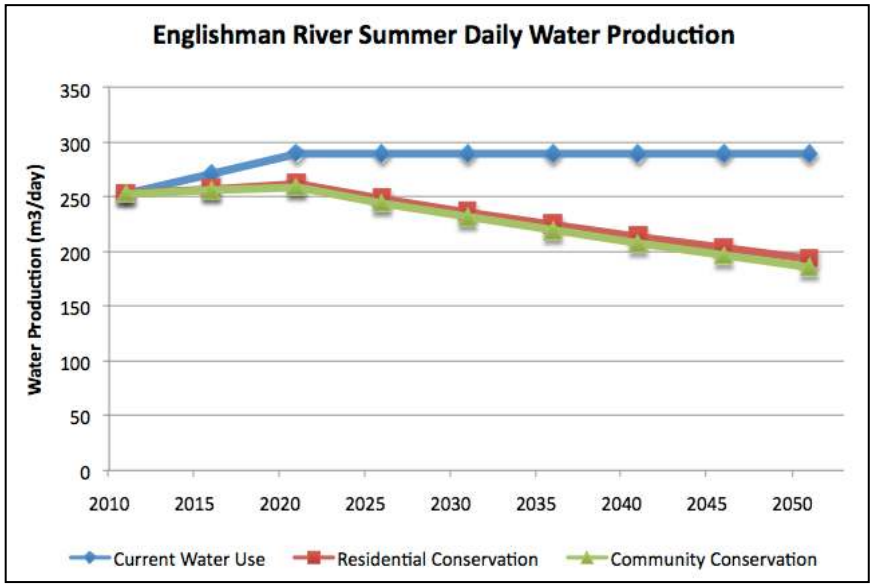
The water use projections below are based on the zoning for each WSA, which indicates that all areas are fully-built except for Englishman River. Three future water use scenarios are shown for each Water Service Area:

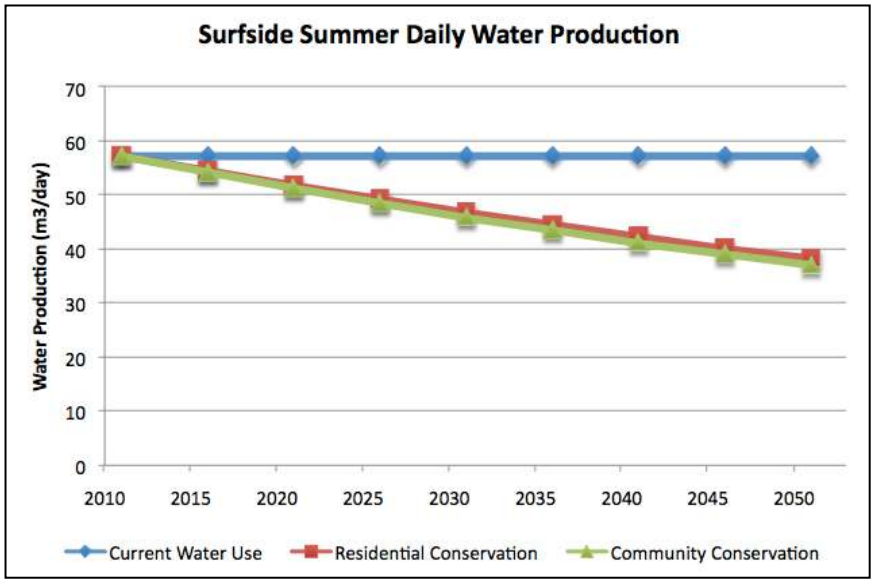
- ***Current Water Use*** – average residential water use and unmetered water remain at 2011 values
- ***Residential Conservation*** – average residential water use is reduced at 1% per year, unmetered water remains at 2011 values
- ***Community Conservation*** – average residential water use and unmetered water are reduced at 1% per year

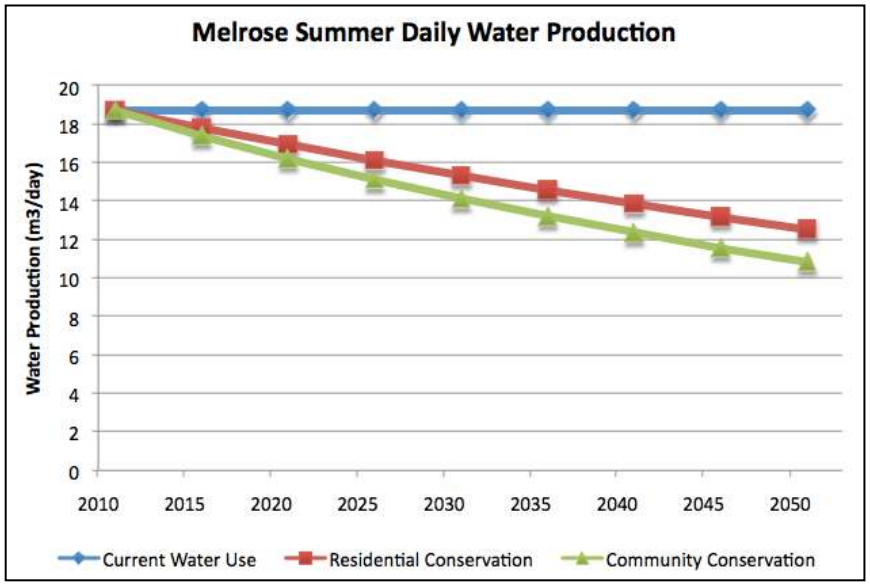
A reduction of 1% per year for the conservation scenarios was selected to reflect the average annual reduction of summer water use per single family residence across the RDN between 2007 and 2011, which was 0.92%.

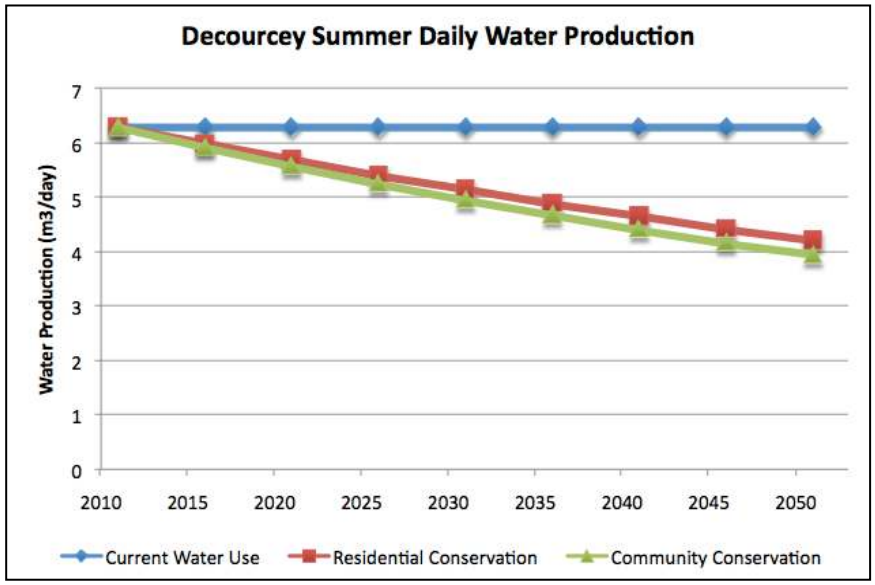



Englishman River Summer Daily Water Production
Water Production (m3/day)
350
300
250
200
150
100
50
0
2010
2015
2020
2025
2030
2035
2040
2045
2050
Current Water Use
Residential Conservation
Community Conservation


Surfside Summer Daily Water Production
Water Production (m3/day)
70
60
50
40
30
20
10
0
2010
2015
2020
2025
2030
2035
2040
2045
2050
Current Water Use
Residential Conservation
Community Conservation


Melrose Summer Daily Water Production
Water Production (m3/day)
20
18
16
14
12
10
8
6
4
2
0
2010
2015
2020
2025
2030
2035
2040
2045
2050
Current Water Use
Residential Conservation
Community Conservation


Decourcey Summer Daily Water Production
Water Production (m3/day)
7
6
5
4
3
2
1
0
2010
2015
2020
2025
2030
2035
2040
2045
2050
Current Water Use
Residential Conservation
Community Conservation

# Appendix D: Water Use Projection Data Nanoose Bay Peninsula

The following tables present data for the Nanoose Bay Peninsula Water Service Area water use projections shown in Figure 3.8. Peak values reached for each category are highlighted in orange.

## Projected Units Nanoose Bay Peninsula WSA

*Assuming 2% annual growth rate for single family units, 4.5% for multi-family units, 1.5 congregate care units per year, and 7.5% annual growth for commercial and institutional floor space to reach Koers' 2031 forecasts and complete build-out by 2046.

| Year | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 | 2046 | 2051 |
|---|---|---|---|---|---|---|---|---|---|
| Single family residences | 2014 | 2224 | 2455 | 2711 | 2993 | 3177 | 3177 | 3177 | 3177 |
| Multi-family residences | 326 | 406 | 506 | 631 | 786 | 980 | 1221 | 1474 | 1474 |
| Congregate care units | 0 | 7.5 | 15 | 22.5 | 30 | 37.5 | 45 | 50 | 50 |
| Commercial floor space ($m^2$) | 2900 | 4205 | 6097 | 8841 | 12819 | 14101 | 15512 | 15625 | 15625 |
| Institutional flood space ($m^2$) | 5085 | 7373 | 10691 | 15502 | 17733 | 17733 | 17733 | 17733 | 17733 |

## Current Water Use Scenario – Average Summer Water Use and Production ($m^3$/day)

*Assuming water use/unit remains at 2011 values, congregate care units use the same amount of water as multi-family units, services remain at 2.4% of production, and unmetered water use remains at 29% of production.

| Year | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 | 2046 | 2051 |
|---|---|---|---|---|---|---|---|---|---|
| Single family residences | 2244 | 2477 | 2735 | 3020 | 3334 | 3540 | 3540 | 3540 | 3540 |
| Multi-family residences | 204 | 254 | 317 | 395 | 492 | 613 | 764 | 922 | 922 |
| Congregate care units | 0 | 5 | 9 | 14 | 19 | 23 | 28 | 31 | 31 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Commercial | 63 | 91 | 132 | 192 | 278 | 306 | 336 | 339 | 339 |
| Institutional | 59.7 | 87 | 126 | 182 | 208 | 208 | 208 | 208 | 208 |
| Services | 87 | 99 | 112 | 129 | 147 | 159 | 165 | 171 | 171 |
| **Water Production** | **3720** | **4217** | **4804** | **5503** | **6268** | **6788** | **7057** | **7294** | **7294** |
| Unmetered water | 1063 | 1205 | 1372 | 1572 | 1791 | 1939 | 2016 | 2084 | 2084 |

## Residential Conservation Scenario – Average Summer Water Use and Production ($m^3$/day)

*Assuming summer residential water use/unit is reduced at 1% per year, congregate care units use the same amount of water as multi-family units, services remain at 2.4% of production, and unmetered water use remains at 29% of production.

| Year | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 | 2046 | 2051 |
|---|---|---|---|---|---|---|---|---|---|
| Single family residences | 2244 | 2356 | 2474 | 2597 | 2727 | 2753 | 2618 | 2490 | 2368 |
| Multi-family residences | 204 | 242 | 286 | 339 | 402 | 477 | 565 | 649 | 617 |
| Congregate care units | 0 | 4 | 8 | 12 | 15 | 18 | 21 | 22 | 21 |
| Commercial | 63 | 91 | 132 | 192 | 278 | 306 | 336 | 339 | 339 |
| Institutional | 59.7 | 87 | 126 | 182 | 208 | 208 | 208 | 208 | 208 |
| Services | 87 | 94 | 103 | 113 | 123 | 127 | 127 | 126 | 120 |
| **Water Production** | **3720** | **4023** | **4380** | **4809** | **5255** | **5445** | **5425** | **5366** | **5142** |
| Unmetered water | 1063 | 1149 | 1251 | 1374 | 1501 | 1556 | 1550 | 1533 | 1469 |

## Community Conservation Scenario – Average Summer Water Use and Production ($m^3$/day)

*Assuming summer residential, commercial and institutional water use/unit is reduced at 1% per year, congregate care units use the same amount of water as multi-family units, and services and unmetered water use are reduced at 1% per year.

| Year | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 | 2046 | 2051 |
|---|---|---|---|---|---|---|---|---|---|
| Single family residences | 2244 | 2356 | 2474 | 2597 | 2727 | 2753 | 2618 | 2490 | 2368 |
| Multi-family residences | 204 | 242 | 286 | 339 | 402 | 477 | 565 | 649 | 617 |
| Congregate care units | 0 | 4 | 8 | 12 | 15 | 18 | 21 | 22 | 21 |
| Commercial | 63 | 87 | 120 | 165 | 227 | 238 | 249 | 238 | 227 |
| Institutional | 59.7 | 82 | 114 | 157 | 170 | 162 | 154 | 146 | 139 |
| Services | 87 | 87 | 88 | 90 | 91 | 87 | 81 | 75 | 67 |
| **Water Production** | **3720** | **3925** | **4166** | **4454** | **4741** | **4803** | **4676** | **4530** | **4251** |
| Unmetered water | 1063 | 1066 | 1076 | 1094 | 1108 | 1067 | 988 | 910 | 812 |

## Appendix E: Actions taken on Recommendations from the 2008 Innovative Options Report

| Water Conservation Recommendations | Actions taken by the RDN |
|---|---|
| **Rainwater Harvesting** | |
| 1. Promote rainwater harvesting systems on the WaterSmart website | WaterSmart website promotes rainwater harvesting and provides advice on purchasing and installing rain barrels |
| 2. Offer a rebate for installation of a rainwater harvesting system | A pilot rainwater harvesting incentive program was run in 2011 and was implemented region-wide in 2012. Incentives for rainwater harvesting, water efficient fixtures and landscaping, and wastewater reuse are also provided as part of a broader RDN Sustainable Development Checklist & Guide for homeowners and owner-builders. |
| 3. Develop rainwater-harvesting guidelines | The RDN has developed a Rainwater Harvesting Best Practices Guidebook with detailed information on residential rainwater harvesting system design and installation. The RDN also provides advice on purchasing and installing rain barrels on the WaterSmart website. |
| **Water Efficiency** | |
| 4. Distribute the *Landscape Guide to Water Efficiency* brochure | Brochure is available on the Team WaterSmart website and is distributed at community events and at residential irrigation audits. |
| 5. Post Team WaterSmart brochures on the website | Brochures are posted on the Team WaterSmart website and are distributed at community events, workshops and at residential irrigation audits |
| 6. Promote the removal of lawns, or the installation of and retrofit to drought-resistant grass | Free Lawn Alternatives & Xeriscaping workshop will be offered to residents twice in spring 2013. |
| 7. Consider other rebates for outdoor water conservation including:<br>• Removal or renovation of an inefficient irrigation system<br>• Water efficient garden designs<br>• Installation of devices that connect irrigation systems to weather stations or other moisture sensors with automatic shut-off device<br>• Irrigation systems designed and installed by an irrigation professional registered with IIABC | Incentives for water efficient fixtures are also provided as part of a broader RDN Sustainable Development Checklist & Guide for homeowners and owner-builders.<br>$100 subsidies offered towards the Irrigation Industry Association of BC's Certified Irrigation Technician (CIT) level 1 course held in Nanaimo, March 2013 to promote efficient design and installation of irrigation systems in the RDN. |

| Water Conservation Recommendations | Actions taken by the RDN |
|---|---|
| • Water efficient fixtures and appliances | |
| 8. Provide information on checking system pressure and properly adjusting irrigation based on available pressure | Free workshops are offered to residents on how to audit their irrigation system and free on-site irrigation check-ups are offered between May and September. |
| 9. Promote retrofits to water efficient fixtures and appliances | Team WaterSmart website promotes retrofits to water efficient fixtures and appliances and provides information on types of retrofits that can be performed |
| 10. Work with school boards and municipalities to support the development of water efficient landscape and irrigation designs at public sites | RDN has hosted meetings such as round-tables for grounds crew to discuss efficient irrigation practices |
| 11. Offer a do-it yourself water audit program to help residents assess water usage and means of improvement | Free workshops are offered to residents on how to audit their irrigation system and free on-site irrigation check-ups are offered between May and September. |
| 12. Encourage contractors and installers to become certified under the existing IIABC program | Course scheduled and subsidized in RDN for 2013 |
| 13. Continue to work with residents on leak identification | Information is provided on the Team WaterSmart website on how to identify and repair leaks and possible issues often identified with billing |
| **Water Reuse** | |
| 14. Collaborate with other authorities to develop policy for water reuse projects | Working with Province |
| 15. Showcase a business or development that installs a greywater or wastewater reuse system | Done through Team WaterSmart workshops |
| **Public Awareness and Involvement** | |
| 16. Enhance the development of the Team WaterSmart website, including calculators and PDF versions of all brochures | The website has been enhanced with PDF versions of brochures |
| 17. Collaborate with the Vancouver Island Watershed Steering Committee | Ongoing |
| 18. Support and promote pilot projects | A pilot cistern project has been completed |
| 19. Expand Team WaterSmart with membership from local municipalities | Completed |
| 20. Highlight positive water conservation stories | The Green Building Recognition Program provides recognition for rainwater harvesting, water efficient fixtures and landscaping, and wastewater reuse in a broader sustainability program |

| Water Conservation Recommendations | Actions taken by the RDN |
|---|---|
| 21. Continue door-to-door and water audit campaigns | Free residential irrigation system check-ups are performed by Team WaterSmart representative |
| 22. Promote various contests and campaigns for high school students and/or residents | Drinking Water Week photo contest and kids colouring contest to launch in March for Drinking Water Week in May. |