Innovative Options and Opportunities for Sustainable Water Use

Prepared for the Regional District of Nanaimo
by HB Lanarc Consultants Ltd.
As prime consultant with:
Highland Engineering & Surveying Ltd.
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HB Lanarc wishes to recognize and thank the following individuals who provided their time and experience to this project:

The consulting team:

David Reid
Landscape Architect, HB Lanarc

Brett Korteling
Environmental Planner, HB Lanarc

Cara MacDonald
Senior Designer, HB Lanarc

Harriet Rueggeberg
Environmental Planner, HB Lanarc

Kelsey Cramer
Research Co-ordinator, HB Lanarc

Derek Lough
Illustrator, HB Lanarc

The client group:

John Finnie
General Manager of Environmental Services, Regional District of Nanaimo

Mike Donnelly
Utilities Manager, Regional District of Nanaimo

Paul Thompson
Manager of Long Range Planning, Regional District of Nanaimo

Sean De Pol
Manager of Liquid Waste, Regional District of Nanaimo

Deb Churko
Engineering Technologist, Regional District of Nanaimo

Nadine Schwager
Liquid Waste Coordinator, Regional District of Nanaimo

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The focus group:

Laura Hunse
Ministry of Environment

Brian Epps
Ministry of Environment

Gary Anderson
Vancouver Island Health Authority

Lynn Magee
Vancouver Island Health Authority

Terry Preston
Vancouver Island Health Authority

Gary O'Rourke
City of Parksville

Bob Weir
Town of Qualicum Beach

Fred Spears
District Municipality of Lantzville

John Elliot
City of Nanaimo

Rob Lawrance
City of Nanaimo

Bill Simms
City of Nanaimo

Sheila Malcomson
Representative, Islands Trust

Jennifer Anne MacCleod
Representative, DWWP Stewardship Committee

Gordon Buckingham
Representative, DWWP Stewardship Committee

Brian Thorburn
Coastal Water Suppliers Association

Curt Kerns
Constructed Wetlands Consultant

Bonaventure Thorburn
Municipal & Land Development Engineering Consultant

Anthony Koers
Koers & Associates Engineering Ltd.

Kevin Luterbach
Iritex Pumps and Irrigation

Dave Scott
Fairwinds Development Corporation

Jennifer Lynch
Vancouver Island Real Estate Board

Bill Benoit
Vancouver Island Real Estate Board

Executive Summary

Projections suggest that population in the Regional District of Nanaimo (RDN) will increase 49% by 2031. During this time climate change will introduce irregular weather patterns that are predicted to include longer, hotter and drier summers.

The RDN operates seven Water Supply Areas that experience regular high summer demand. With the goal of addressing peak summer water use in these Water Service Areas, and an appreciation that water use will be an evolving concern for the Electoral Areas, the RDN requested this study to investigate innovative options and opportunities for sustainable water use.

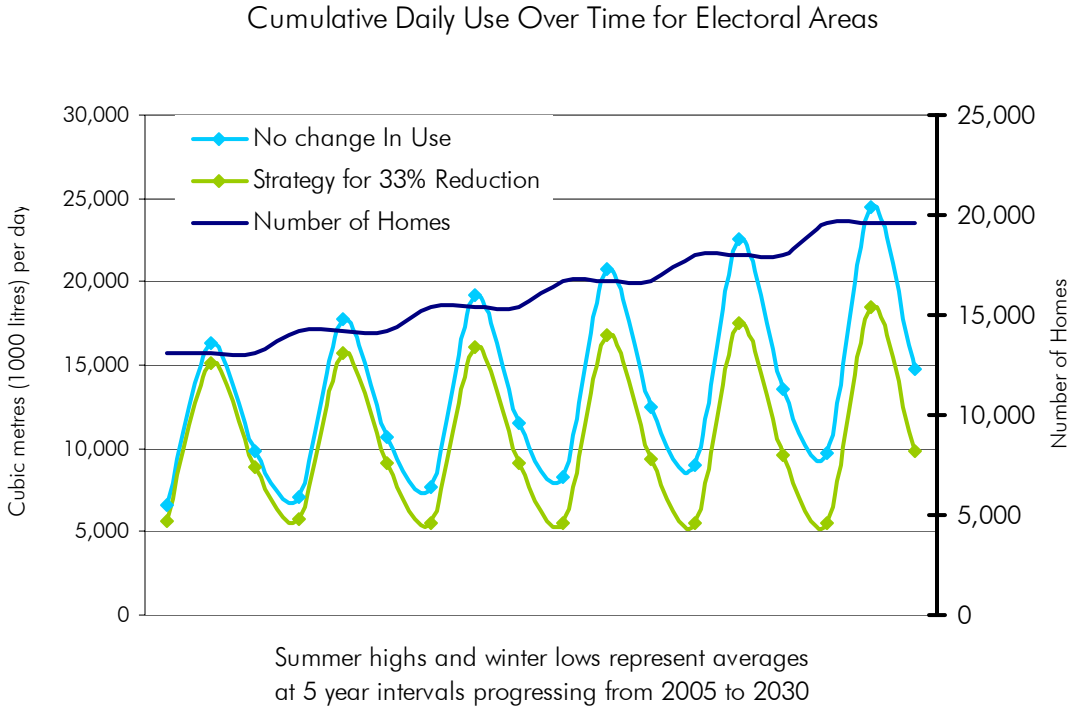

Figure E-1. Cumulative daily water use with 33% reduction strategy

A target of a 33% reduction from an average household use of 800 litres per day is recommended as an achievable goal to reach a steady state water use rate as populations increase up to 2030. Average water use portrayed as the middle dot on the curve ahcieves a steady date while summer use still rises slightly. The actions that form this strategy address aspects of demand side management, rainwater harvesting, wastewater reuse, public education and involvement, and administrative procedures. All actions are listed in a sequential implementation scheme organized to build on success.

The strategy aims to increase awareness with education, foster the adoption of innovative techniques with promotion and then confirm water conservation success, where appropriate, with regulation.

Progress towards water conservation in the RDN is already underway. Using the start of 2004 as a reference point and reviewing RDN stats for water production and per capita use rates, there has been a gradual decline in both winter and summer water use. This decline could be attributed to initiatives started in the years following 2004. There were a number of programs started by the RDN in response to concerns for high water consumption patterns from 2000 to 2003: including the creation of the Water Smart program, requirement for low flush toilets, refinement of incline block water rates, door-to-door information campaigns, other Water Smart outreach projects and the publication of water conservation educational materials on the Water Smart website.

Five years to build the policy infrastructure for a 33% reduction in water use in by 2018.

Perhaps customers in the RDN water service areas are using less water as a result of media portrayals of water shortages and water conservation, the increased awareness of xeriscaping, or other factors. Whatever the cause, (probably a combination of many factors), the effect is that since 2004 there has been a gradual decline in water use close to 8%. Assuming a continuing trend, this means that progress towards a 33% reduction is already a quarter of the way there and roughly speaking, a further reduction of only 25% is needed to achieve the overall goal.

Monitoring this trend in declining water use over the coming years can help guide the intensity of water conservation initiatives that are needed. A Water Efficiency Coordinator would be able to gauge the success of less costly initiatives to see where, when and if more costly programs will be needed.

Easing In the Changes

Ten major steps over 5 years will create the momentum and background needed to have significant water conservation under way. To achieve a further 25% reduction in water use by 2018, the strategy will continue an additional 5 years with evolution of applications and installations and adaptive

adjustments to work program priorities and goals. The consensus from a majority of the participants of the workshop on sustainable water use was that this reduction target is achievable within 10 years. A long-term strategy will buttress successful initiatives and adjust to changes in the earth's climate, social needs, technological innovation and the development market. Table E-1 outlines an action plan for implementation in the first five years:

Phase 1 2008 Focus is on setting the stage – including raising the level of water use awareness and conservation possibilities with online tools, door-to-door campaigns and personal water audits, working with stakeholders to strategize key policy changes, and gaining Board support and budgets. During this stage landscape and irrigation design standards can be developed to address summer water use for Industrial, Commercial, Institutional and Multifamily developments.

Phase 2 2009 Two sets of actions run in parallel. (1) To deal with summer water use: updating the Water Use Bylaw with a summer conservation surcharge and implementing landscape and irrigation design standards for ICI and Multifamily. (2) To continue the development of a strategic direction: the hiring of a water efficiency coordinator and developing a water conservation plan. These actions may be linked to the Drinking Water / Watershed Protection Action Plan items.

Phase 3 2010 This phase would build on the background of sustainable water use awareness with the introduction of incentive programs, showcasing of pilot demonstration projects and the development of proper guidelines for the installation and use of alternative water sources such as rainwater harvesting systems and wastewater reuse.

Phase 4 2011 This phase would combine the success of incentives and promotions with key pieces of regulation. A Water Smart certification program could be developed for households to qualify for an exemption from watering restrictions. For single-family homes (in addition to other uses implemented earlier), landscape and irrigation standards as well as a means to manage irrigation or a fee structure to promote water efficient practices could be required. Rainwater harvesting could be required for larger, comprehensive developments and wastewater reuse could be encouraged through development incentives.

Phase 5 2012 The building blocks of a sustainable water use strategy would be in place. Further additions that are possible in the future would be guided by collaborative strategic planning within the RDN. The retrofit of older homes with water efficient technology and practices would be encouraged.

IIABC = Irrigation Industry Association of BC

BCLNA = BC Landscape and Nursery Association

BCSLA = British Columbia Society of Landscape Architects

Implementation Action Plan

Working with existing qualified individuals and organizations is key to success. Early implementation steps will focus on proper landscaping and irrigation procedures. The requirement for a Water Smart Certified landscape and irrigation design will motivate an increase in Certified Horticultural Technicians and Certified Irrigation Designers.

Table E-1: Implementation Action Plan

Phase/Project #	Action	Action Leader	Action Partners
1A	**Increase education – set the stage.**		
1A1	Distribute landscape guide to water efficiency brochure.	District staff	Stakeholders
1A2	Facilitate voluntary meter reading, enhance water bill format, post water use calculators and alternative water source examples on website.	Consultant	District staff
1A3	Increase door-to-door campaign. Quantify and monitor results.	Team Water Smart	District staff
1A4	Offer water audits. Quantify and monitor results.	Consultant	Team Water Smart
1A5	Include water purveyors, irrigation specialists, engineers, developers, realtors and others in outreach campaigns. Establish a quarterly working committee with RDN staff to strategize innovative methods for water centric development.	District staff	Stakeholders
1A6	Consult with the Vancouver Island Watershed Steering Committee.	District staff	Stakeholders
1B	**Develop landscape and irrigation design standards, specs, draft bylaws**		
1B1	Create draft landscape and irrigation design standards/ specs.	Consultant	IIABC, BCSLA, BCNTA
1B2	Create bylaw updates (Subdivision, Building, Water bylaws) for ICI and Multifamily	Consultant	District staff
1B3	Perform legal and Board review, stakeholder review	District staff	Stakeholders
1B4	Support Board adoption of standards / bylaw revisions.	District staff	Consultant
1B5	Create forms / checklists for plan checkers and designers.	District staff	Consultant, IIABC, BCSLA, BCNTA

Phase/Project #	Action	Action Leader	Action Partners
1B6	Organize review and approval process.	District staff	Consultant
2A	**Adjust water use bylaw (first step)**		
2A1	Introduce summer conservation surcharge to emphasize the higher value of summer water.	District staff	Consultant
2A5	Require a permit for irrigation and/or charge a water use impact fee.	District staff	Consultant
2B	**Develop strategic plan**		
2B1	Hire Water Efficiency Coordinator.	District staff	
2B2	Develop water conservation plan as described in the Drinking Water-Watershed Protection Report.	Consultant	District staff
3A	**Create incentive programs**		
3A1	Develop a turf replacement program.	Consultant	District staff
3A2	Pay partial amount towards the removal or renovation of an inefficient irrigation system.	District staff	Consultant, IIABC
3A3	Offer a one-time discount in water rates for water efficient landscape and irrigation design – new and retrofits.	District staff	IIABC, BCSLA, BCNTA
3A4	Offer rebates/discounts for dual-flush or composting toilets and efficient fixtures.	District staff	Local Contractors
3B	**Pilot ICI and Multifamily projects**		
3B1	Showcase landscape and irrigation standards.	District staff, IIABC, BCSLA, BCNTA	Development Community
3B2	Showcase innovative rainwater harvesting system for irrigation and/or indoor use.	District staff	Development Community
3B3	Collaborate with business and development community to pilot a water-recycling project. This could be water recycling within a commercial or industrial operation or reuse of water from RDN sewage plant upgrades.	District staff	Business, Development Community
3B4	Prepare summary report on pilot projects. Continue to monitor and report.	Consultant	District staff
3C	**Enable proper use of alternative water sources**		

Phase/Project #	Action	Action Leader	Action Partners
3C1	Include rainwater harvesting guidelines and standards for indoor and outdoor use.	Consultant	District staff, VIHA, MoE
3C2	Include greywater and wastewater reuse guidelines and standards, for installation of shower and bath to toilet indoor system and subsurface outdoor irrigation system.	Consultant	District staff, VIHA, MoE
4A	**Adjust water use bylaw (second step) Water Smart Program**		
4A1	Create Water Smart Certification criteria and develop an application form and audit process.	Consultant	District staff
4A2	Develop a Water Smart Household public involvement campaign.	Team Water Smart	Consultant
4A3	In the Water Use Bylaw, allow eased watering restrictions Water Smart Certification.	District staff	Consultant
4A4	Offer contest to attract a few pilot households for Water Smart Certification.	Team Water Smart	District staff
4B	**Regulation adoption - Building Bylaw and zoning updates**		
4B1	Integrate landscape and irrigation standards as a requirement for single-family developments. These standards are already required for ICI and Multifamily. Require a weather-based ET Sensor for all irrigation installations.	District staff	Consultant
4B2	For new comprehensive multi-home developments, require a collective water harvesting system for irrigation purposes – i.e., install line feeds from roof leaders to a central rainwater reservoir or detention vault.	District staff	Consultant
4B3	Offer incentives for larger developments that demonstrate a water efficient development including either rainwater harvesting and/or greywater wastewater reuse.	District staff	Consultant
5A	**Integrated Comprehensive Water Management**		
5A1	Create an action plan for the second five years of the program.		
5A2	Assess the impact all new development will have on water systems. Require minimal impact.	District staff	
5A3	Collaborate strategic planning for water supply, stormwater management and wastewater management. Capitalize on rainwater harvesting benefit for stormwater attenuation.	District staff	

Phase/Project #	Action	Action Leader	Action Partners
5A4	Promote a Water Retrofit contest. Create incentives for housing stock to be more water efficient.	Team Water Smart	District staff
5A5	Check in routinely with the public and businesses via surveys, focus groups, etc. to see what information and programs they need to achieve water efficient behaviour.	Team Water Smart	District staff
5A6	Add a component of price to convey the value of water in itself, beyond just the cost of distribution.	District staff	Consultant

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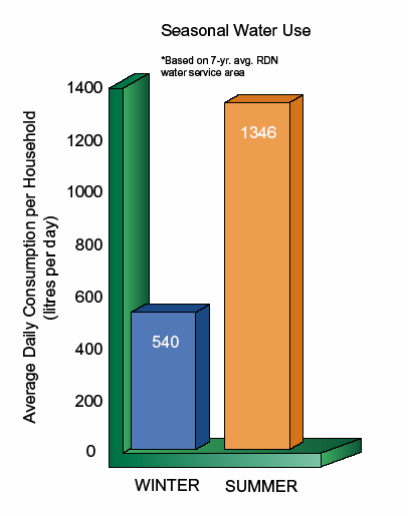
1.0 Introduction



Average water use in summer months is slightly more than twice winter use amounts. It is not uncommon for summer water use to be 2.5 times and even 3 times winter use rates.

Although the region may seem water rich in the winter months, the balance shifts abruptly during long dry summers. This region is geographically close to the rainforest climate, but a large portion of the coastal areas, which hold a majority of the population, are within the Nanaimo Lowland ecosection, a coastal plane with a mild climate and low snow depths. Many of these coastal areas are also part of the Coastal Douglas Fir (CDF) biogeoclimatic zone, characterized by a temperate climate with dry summer months. The CDF is a unique and rare ecosystem only found in Eastern Vancouver Island, the Gulf Islands and areas south of Metro Vancouver. A biogeoclimatic zone is a finer scale division of the landscape than an ecosection.

This Nanaimo Lowland is close to the wetter Island Mountain ecosections and the CDF is close to the rain dominated Coastal Western Hemlock (CWH) biogeoclimatic zone, but the landscape within the Nanaimo Lowland and CDF zones evades the frequent rainfall that more mountainous areas in southern BC experience.

Most of the water for electoral area populations is sourced from groundwater and because of the coastal location, pumping rates must be managed to avoid salt-water intrusion.

Climate change predictions forecast more severe weather with hotter, drier summers that could lower base stream flows to critical levels. Such weather changes will cause increasing stress on salmon and aquatic ecosystems.

As seen in the seasonal water use graph in the side bar, the resident human populations significantly increase their water use during these summer dry periods. As depicted in figure 1-1, the graph comparing average precipitation and average demand, this water is taken in large quantities at the same time it's at its lowest supply.

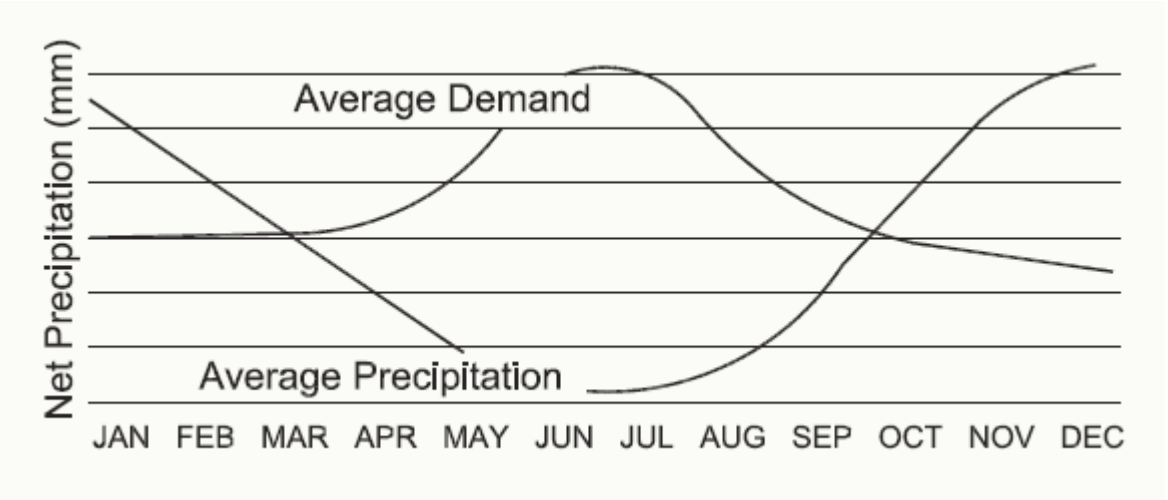


Figure 1-1. Comparison of precipitation rates and water use rates

Add a projected population increase of 49% by 2031 to the environmental constraints and to the existing heavy water demands and the result is a supply and demand equation out of balance.

This study investigates how to balance that equation and devise a strategy to work towards sustainable water use into the future. The principles of the strategy are in line with the Soft Path to water management as described by Oliver Brandes of UVIC's POLIS project and David Brooks of the Friends of the Earth Canada. The Soft Path focuses on reducing water use through innovation, conservation, water reallocation and changing patterns of use and reuse. (Brandes et al., 2007) The main difference with this study is that instead of defining a desired future state or ecological limit on water, as is recommended with the Soft Path approach, this study proposes to adjust usage patterns as population increases so that no more water is taken from the environment than is currently used.

It is in the best interests of the RDN to better understand the regional ecological limits to its water supply. With this knowledge, appropriate water conservation efforts can be targeted. Understanding these limits can be achieved through hydrologic assessments and monitoring as suggested in the Drinking Water / Watershed Protection Plan.

The focus of this study is on the RDN Water Service Areas. Recommendations may also have merit for the rest of the Regional District including the municipalities, which will house the bulk of new residents. Within

the Water Service Areas, because of lot configuration and subdivision potential, the bulk of the total projected growth and therefore the potential for water savings will occur on the Nanoose Peninsula.

The basic principles are simple:

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

Developing the formula is a little more complex and involves:

- balancing the possibilities of water-efficient technology with the impediments of regulation and concerns for public health,
- shifting traditional water use practices that originated from times of perceived abundance to more environmentally conscious and efficient water use habits, and
- establishing a series of initiatives and actions that increase the adoption rate of water saving practices.

Water use affects many facets of society. There will need to be many coincident initiatives to achieve sustainable water use.

The RDN has a good momentum in process to solve the equation. The Watersmart education outreach program and Team WaterSmart are substantially developed programs poised to be a leader in the knowledge transfer and practical application of efficient water use. Internal water management policies are proactive and focussed on conservation. The intent of many regional Official Community Plans speak of living within the hydrologic limits of the surrounding environment and lessening the impact of waste on aquatic ecosystems.

By involving the public, collaborating with water related agencies and developers, regulating development and opening the door to innovation, the RDN is well poised to facilitate a progressive shift in water consciousness.

2.0 Techniques to Achieve Water Sustainability

2.1 Summary

In the development of strategies to achieve water sustainability, two groups of techniques are investigated:

Applications – physical actions, constructions and installations that lessen dependence on water supply from mains and/or groundwater. In this study we analyze three main groups of water saving applications:

- Rainwater Harvesting
- Demand Side Management
- Wastewater Reuse

Enablers – education, promotion, incentives, regulations and any other measure that increases the adoption rate of water saving applications. In this study we look at two main groups of enablers:

- Administration – including metering, pricing, billing and water restrictions.
- Public Education – including public, business and institutional awareness and involvement.

It is the combination of applications and enablers that creates a successful sustainable water use program. Almost all of the water saving applications described in this report could be implemented tomorrow with existing technology and regulations.

This chapter reviews current sustainable water use practice in the RDN; explores the possibility that new applications and enablers can offer and provides a description of potential water saving techniques based on precedents in other jurisdictions.

2.2 Sustainable Expansion of Supply (Rainwater Harvesting)

2.2.1 Existing

On Gabriola Island many homes use **rainwater as their only source** of potable and non-potable water.

- potable – drinking, cooking and *bathing.
- non-potable – toilet flushing, laundry, domestic cleaning, car washing or garden needs.

*The European Union defines a recreational class of water quality and would support the use of rainwater for bathing. They view bathing similar to swimming in a river or lake.

At present, subdivision approval does not recognize rainwater as a source of water for a subdivided lot. **With proper storage, treatment, management and monitoring**, the Vancouver Island Health Authority **will consider rainwater as a source of potable water** for an existing lot and a supplemental supply to a community system.

There is no clear indication or guidelines in the BC Building Code concerning the installation of rainwater harvesting technology. The plumbing code states that separate piping and backflow prevention are required for non-potable sources of water. The benefits of rainwater harvesting are currently being explored as part of background research for the BC Green Building Code. The use of rainwater for a single-family home falls outside the scope of the Drinking Water Protection Act.

Rainwater harvesting has a very large influence on the attenuation on stormwater flows. Stormwater management is of increasing importance for developing areas as land surfaces become impervious to infiltration. There is a global trend towards Integrated Comprehensive Water Management (ICWM), currently practiced in Australia, whereby all flows of water including wastewater are managed as an integrated system. A key relationship in ICWM is the relationship between rainwater harvesting and stormwater management. There are multiple benefits to harvesting rain before it touches polluted streets. Rainwater harvested from roofs can be reused with little treatment and the temporary cistern storage of this stormwater reduces peak flows that could erode local streams and aquatic systems at an unnatural rate.

It takes one gallon per week to water 2 square feet of conventional turf and the same amount per month for drought resistant grass.

A 1,200 gallon cistern could water a 200 square foot conventional lawn for 12 weeks. Less than half the cistern would be used in one year for a drought resistant lawn.

2.2.2 Technology

Rainwater harvesting tanks and collection system.

BC examples

Australian example

Contacts: http://www.bluescopewater.com.au/

http://www.rainwaterconnection.com/

Purpose:

Indoor or Outdoor efficiency

Description:

Rain is collected on the roof, captured in screened gutters and then passed through a leaf-catcher to filter off larger pieces of debris. A first flush device separates the first wash of water off the roof to waste. The rest of the water flows into a cistern for storage through screened inlets.

For potable water: upon leaving the cistern, the water flows through more filtration (e.g. 5 micron sediment and carbon block filter) and is then disinfected with UV before entering the household pipes. Some systems included residual chlorine treatment as well.

Potential savings:

Assuming a daily indoor use rate of 500 litres per home and a summer daily outdoor use rate of 750 litres per home for 4 summer months. A 5000 litre cistern collecting from a 1500 square foot roof in the Nanaimo region could save 60% of the indoor water needs (40% of yearly water use). The same configuration would save 21% of outdoor use (7% of yearly water use). A 2500 litre cistern collecting from a 1500 square foot roof in the Nanaimo region could save 60% of the indoor water needs (40% of yearly water use). The same configuration would save 19% of outdoor use (6% of yearly water use).

Approx. cost:

Tank $1000 - $1500, harvesting system installation for indoor use with filtration and no disinfection $3,000; with disinfection for potable use $8,000.

Examples of use:

Ruby Alton House, Salt Spring Island and Echo Haven, Calgary, Alberta.

Davey RainBank® switch.

Contacts: http://www.davey.com.au/

Purpose:

Indoor or Outdoor efficiency

Description:

The RainBank® switch is a key component of a rain harvesting system that is connected to a water main or well. The switch will take water from the mains or well source whenever the rainwater cistern is low and will switch back to a rainwater supply when the tank is full enough. This technology is currently used in Australia, but not yet imported to Canada.

Potential savings:

Provides water supply from the mains for house distribution when cistern volume is low. Incorporates cross connection control, superior energy performance to "top-up" systems because the Rainbank does not depressurize mains water.

Approx. cost:

$1000

Examples of use:

Common in Australia.

2.2.3 Precedents

The Ruby Alton House on Salt Spring Island collects rainwater on the roof, pipes it through a series of successively small filters and stores the filtered water in a plastic lined corrugated steel tank. Before the stored water is brought into the home for all needs including drinking, it passes through a UV filter for disinfection.

In many parts of the world larger developments and neighbourhoods harvest rainwater for non-potable needs. It is common for new construction in Australia and other countries to include, and often require, a rainwater harvesting system. Every home in Pimpama Coomera, a 120,000 unit development in the Gold Coast of Australia, will have a rainwater collection system to satisfy laundry and outdoor gardening needs.

Projects in Ontario are permitted to use rainwater for toilet flushing and laundry utilizing only simple filtration and first flush devices for pre-treatment. The Echo Haven 25 unit bare land strata development near Calgary, stores rainwater collected from the roof in 6,000 litre cisterns located in the basement of each house. This water is treated with Membrane Reactor Technology before it is used for laundry and outdoor garden needs.

In Belgium National Legislation requires rainwater harvesting on all new construction for flushing toilets and external water use. There are two main reasons for this legislation:

- To reduce the demand for treated water and expansion of water supply infrastructure
- Stormwater abatement

2.3 Efficient Use (Demand Side Management)

2.3.1 Existing

Average summer water use in the RDN is 2.5 winter use. Water use in the summer of 2006 was an extreme 3.1 times the winter use.

This peak summer use taxes the system at a time when there is the least amount of water. Limiting outdoor watering with **different landscape design will increase water system longevity** and opportunities for sustainable supply. Practicing efficient water use in the home will **leave more water in the aquifers for summer when it's needed the most**.

The average ratio of summer use over winter use in the RDN local water service areas has been greater than 2.2 for the past 7 years. Water use in the summer of 2006 was an extreme 3.1 times the winter use.

This peak summer use taxes the system at a time when there is the least amount of water. Limiting outdoor watering with different landscape design will increase water system longevity and opportunities for sustainable supply.

Landscape and Irrigation Design

Team WaterSmart promotes xeriscaping, drought-resistant turf landscaping and efficient irrigation design and management through door-to-door visits, workshops and brochures. There are links on the website with information on xeriscaping, 'Go for Green Water-Wise Gardening' and CMHC 'Water Saving Tips for Your Lawn and Garden'.

http://www.rdn.bc.ca/cms.asp?wpID=878

In 2007, a pilot project involving 2 multifamily condo developments assessed the efficiency of irrigation systems connected to on site local weather stations. The results of this study show an 8% reduction in water use for one development and 2% reduction in the other. The lower reduction in the second home is attributed to a leak in the system.

An irrigation audit of 5 homes was completed during the same period and the findings revealed that significant improvements could be made on all 5 irrigation systems in terms of design, construction and maintenance as well as run times. Homes that took care of basic repairs witnessed an immediate savings in water use.

Fixture Retrofit

The WaterSmart website suggests retrofitting with an efficient toilet, low-flow showerheads and high-efficiency washing machines. Team WaterSmart explains low flow toilets in an educational brochure. No rebates are offered. Note that low flush (6 litre) toilets are now mandatory in the Nanaimo Region.

Fixing Leaks and Pressure Management

There are two areas to conserve water by fixing leaks and pressure management: the water distribution system and the development whether it be a single-family home, multifamily development or at a commercial and industrial scale.

The system distribution lines are take care of by the RDN through a regular program that continues to track distribution losses and make necessary repairs to leaks.

To support water efficiency in the single-family home, the RDN acknowledges fixing leaks as one of the three R's to achieve water conservation:

1. Reduce: make changes to water use habits
2. Repair: fix those leaks.
3. Retrofit: adapt or replace less water efficient fixtures or appliances with water saving devices.

The RDN utilities department has a process in place to identify possible leaks on a customer's property. If there is a suspected leak, door hangers are placed on the customer's door, along with a phone call and/or letter to follow up. During the summer of 2007 Team WaterSmart worked in collaboration with the Code Blue program to identify toilet leaks.

There are two main areas to adjust pressure:

1. Household water system: A certain amount of pressure is needed to reach the second floor of homes, but too much pressure wastes water unnecessarily every time a tap is turned on.
2. Irrigation system: Excess pressure leads to misting, which increases evaporation and wind-drift water losses. Pressure can be reduced either in the rotor head itself or in the irrigation pipe and valve.

2.3.2 Technology

Landscape and irrigation design.

Contacts: http://www.ci.austin.tx.us/growgreen/

http://www.h2ouse.org/gardensoft/index.aspx

http://www.iritex.ca/

Purpose:

Outdoor water efficiency

Description:

A soil depth of at least 150mm under turf and 300mm under shrubs and bushes will retain water. Moving to drought tolerant plants and removing turf lessens water needs. Designing a garden with hydro zones (plants with similar water needs are grouped together) allows for proper irrigation design and water allocation based on plant needs. Head to head spacing, automatic shut-off, evapotranspiration (ET) based irrigation controllers, pressure management and accurate, seasonally appropriate time clock setting are all steps that ensure irrigation systems are running at maximum efficiency.

Potential savings:

A range of 10-50% savings of outdoor use with proper soil installation, planting and irrigation design. An outdoor efficiency savings of 22% for 4 months of the year would take 7% off yearly water needs when applied to a household with a daily use pattern of 500 litres indoors and 750 litres outdoors.

Approx. cost:

Variable depending on garden size and design.

Examples of use:

Central Vancouver Island Botanical Garden Society Water Wise Demonstration Garden, 2324 East Wellington Road, Nanaimo, BC

Dual flush toilets and low flow fixtures  **Contacts:** http://www.sustainablesolutions.com/ http://www.scrd.bc.ca/infrastructure_bathroomfixture_replacement.html	***Purpose:*** Indoor water efficiency ***Description:*** Dual flush toilets have 3 litre and 6 litre flush mechanisms. Low flow showerheads have a 5.7 litre per minute flow rate; traditional showerheads flow at 9.5 litres per minute. Low flow sink aerators have a 3.4 litre per minute flow rate; traditional aerators flow at 7.6 litres per minute. ***Potential savings if applied in the RDN:*** 39% of indoor use; 26% off yearly average. ***Approx. cost per bathroom:*** $300 wholesale for community scale campaign (installed). ***Examples of use:*** Sunshine Coast Regional District promotes a successful bathroom retrofit campaign that includes installation free of charge. Many other North American communities promote bathroom fixture retrofit campaigns.
Composting toilet  **Contacts:** http://www.compostingtoilet.com/, http://www.envirolet.com/, http://www.clivus.com/, http://www.ekolet.com/ekolet-eng/index.htm	***Purpose:*** Indoor efficiency ***Description:*** There are a variety of sizes and combinations available. The basic structure is a straight drop to a composting/aerating tank. A fan is used to maintain the airflow that removes the moisture from waste. About 97% of the waste is water. The remainder composts to an inert state. Often composting materials and worms are added to facilitate the decomposition. Composting toilets at the CK Choi building, UBC have been installed for 10 years and do not yet need to be emptied. ***Potential savings if applied in the RDN:*** 30% of indoor use; 20% off yearly average.

	Approx. cost: Residential system for $3,000 to $6,000 and institutional configurations for $18,000 to $35,000 ***Examples of use:*** Ck Choi building at UBC, Malahat rest stop, West Vancouver Yacht club outstation.

2.3.3 Precedents

Landscape and Irrigation Design

At the Water in the City Conference of 2006, representatives from the Region of Durham, Ontario and King County, Washington presented statistics that revealed an overall drop in water use at a time of growing population thanks mainly to a change in outdoor water use behaviour.

The City of Kelowna has initiated the Drought Tolerant Eco-Lawn Cost-Sharing Incentive. If the homeowner pays for the seed, the City will pay for the shipping. The City of Kelowna is also developing landscape and irrigation standards with a goal to cut summer water use by 16%.

The Capital Regional District offers a $50 rebate for the purchase of a 365-day irrigation controller and $25 for a rain shut-off device.

In 1992 the City of Sacramento invoked an ordinance outlining "Water Conserving Landscape Requirements". The major aspects of this ordinance include the submission of a Planting Plan, Irrigation Plan, Sloped Areas (grading plan), Soils Report and an Irrigation Schedule. The ordinance applies to all rehabilitated and new landscaping for industrial, commercial, office and institutional sites, as well as to parks, and recreational areas, city road medians and corridors. Multi-family residential and model home complexes must also meet these requirements.

The City of San Bruno, CA developed a comprehensive guide for landscaping and irrigation systems that service new and rehabilitated landscaping for public agency projects, developer initiated projects and homeowner projects of greater than 4 dwelling units. Extensive designs and calculations are required. See Appendix C for a copy of the guide.

The City of Austin, TX has a suite of information to help with the planning and design of an irrigation system.

http://www.ci.austin.tx.us/watercon/irrigation.htm,

green gardening http://www.ci.austin.tx.us/greengarden/,

and landscaping http://www.ci.austin.tx.us/growgreen/.

The Sunshine Coast Regional District offers three different water efficiency assessments

http://www.scrd.bc.ca/documents/verybasicwateraudit.pdf

http://www.scrd.bc.ca/documents/Basic%20Water%20Audit%20Worksheet.pdf

http://www.scrd.bc.ca/documents/comprehensive%20water%20audit.pdf

Fixing Leaks and Pressure Management

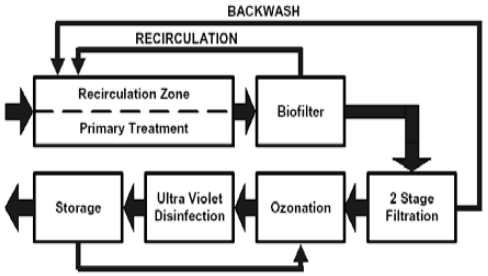
Guided by audits of irrigation distribution uniformity and scheduling times, Tucson Unified School District, Arizona retrofitted their systems with proper design, new rotor heads and appropriate pressure setting and watering times. As a result, TUSD has avoided $2 million dollars in energy and water costs over a 5-year period. *With proper irrigation equipment that regulates pressure in each spray head, large savings can occur*. "Every 5 psi reduction in water pressure reduces water use by 6–8%. The savings are over 50% if a 70 psi spray zone is reduced to the recommended 30 psi." (Rainbird 2007)

Fixture Retrofit

The Sunshine Coast Regional District estimates that their bathroom fixture retrofit campaign will defer infrastructure upgrades for 5 years.

The Saving Water Partnership of Seattle and Participating Local Water Utilities offer an extensive rebate program http://www.savingwater.org/rebates.htm.

2.4 Maximizing Reuse and Recycling (The End of Wastewater)



The technology exists to recycle wastewater to a level that is accepted for non-potable uses. This practice occurs across Canada and on Vancouver Island. Proper promotion and practice would allow the reuse of water to be common place in more homes and businesses, thus offering NEWater to the water balance and taking less water from the environment.

2.4.1 Existing

Common wastewater terms used in this document are:

Greywater – water from sinks (other than kitchen) including shower, bath and laundry

Wastewater/Blackwater – water from all indoor sources including kitchen sink and toilets

Reclaimed or recycled water refers to water that has been used once and then treated to a level appropriate for its next use.

Reused water refers to water that is used once and then used again without any treatment. An example is a home-based greywater system that transfers greywater from the shower, bath and sink to a below ground drip-irrigation system with only simple filtration as a treatment step.

The Liquid Waste Management Plan Stage 3 Report published in 1997 mentions reuse in a variety of contexts:

- "assess sewage treatment, reuse and disposal facility needs for future Village Centres"
- "pre-design for expanding and upgrading to secondary treatment the Nanoose Bay WPCC to serve 6,000 people, including the evaluation of either filtration or 60 days storage to allow the production of unrestricted use of reclaimed water"
- "Within the Northern Community further investigate the opportunities for use of reclaimed water; on golf courses, pasture and cropland, forestland"
- "develop a concept design… for seasonal irrigation in Coombs [with recycled water]"

Many OCPs mention proper stormwater management as well as alternate disposal methods for greywater and sewage.

During the months of May through September an average amount of 10% of the treated effluent from the French Creek Pollution Control Centre is recycled and used for irrigation at the Morningstar golf course. A community in Errington has installed a solar-aquatic sewage treatment alternative to conventional septic that uses plants to break down waste. In Cumberland, to the north, the final design stages are being completed for a Constructed Treatment Wetland to improve outflow quality before it enters Maple Creek.

There may be home designed greywater systems already at work in water scarce parts of the Nanaimo region. The Municipal Sewage Regulation permits the large-scale use of recycled water once treated to a

certain standard, but does not define the terms and conditions for applications in the single family home setting. As stated in the MSR "At this time, use of reclaimed water within a single family dwelling is not recommended, unless specific measures, developed in consultation with MELP and the local health authority, are in place." There is room to evolve an acceptable approach in conjunction with MoE, VIHA and other local governments.

Greywater recycling is currently being explored as background research for the BC Green Building Code and Health Canada has issued a draft for consultation on Canadian Guidelines for Household Reclaimed Water for Use in Toilet and Urinal Flushing. Broader policies that support and guide wastewater reuse are beginning to form.

2.4.2 Technology

Install a BRAC® Indoor greywater system.

Contacts: http://www.bracsystems.com/

Purpose:

Indoor and potentially outdoor water efficiency

Description:

This tank collects water from the shower, bath and laundry, filters and disinfects it and then redistributes it to the toilet for flushing.

Potential savings if applied in the RDN:

30% indoor savings if all toilet-flushing needs are met and 20% off yearly water use. More savings if recycled water is also used for outside irrigation.

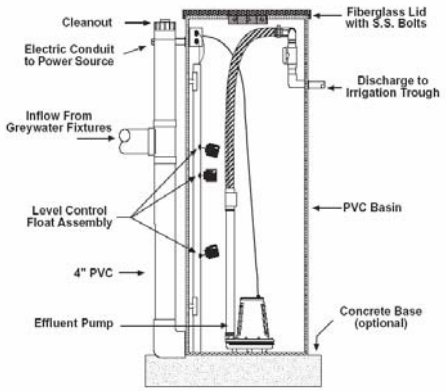
Approx. cost:

$1700

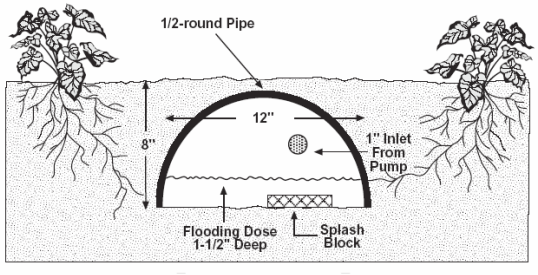
Examples of use:

Invermere, BC and other pilot communities in BC.

Clivus Multrum® Outdoor greywater system.



Dosing Basin



Leaching Chamber

Contacts: www.clivusmultrum.com

Purpose:

Outdoor water efficiency

Description:

This tank collects water from the shower, bath, laundry and all sinks, filters it and distributes it through a subsurface leaching chamber. The greywater receives treatment from bacteria and microorganisms found in the soil.

Potential savings if applied in the RDN:

47% of outdoor irrigation needs and 16% off yearly water use when applied to a household.

Approx. cost:

$4000

Examples of use:

Bunker Interpretive Center, Calvin College, Grand Rapids Michigan. A custom designed subsurface greywater treatment system developed by Ed Hoeppner of Aquarian Systems is in use at the Recycling Depot and private homes on Hornby Island, BC.

Aquacycle 900 ® Indoor greywater system.

Contacts: http://www.freewateruk.co.uk/

Purpose:

Indoor and potentially outdoor water efficiency

Description:

The aquacycle collects water from the shower and bath, filters it, treats it with UV disinfection and then distributes it to toilets, laundry, domestic cleaning and outdoor garden needs.

Potential savings if applied in the RDN:

50% if supplies all toilet flushing and laundry needs and 33% off yearly water use when applied to a household. More savings if water is also used for outside irrigation.

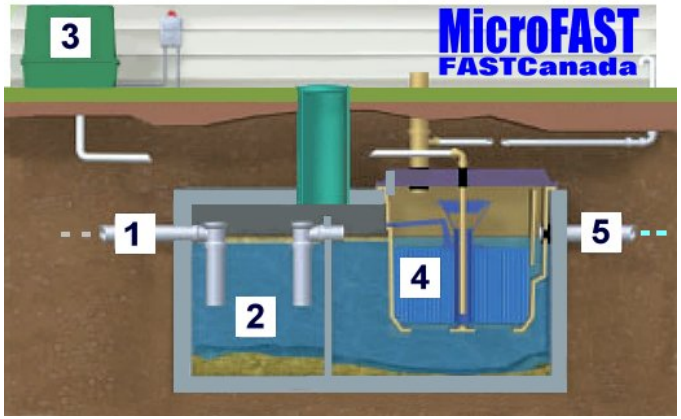
Approx. cost:

$6500

Examples of use:

Product from the United Kingdom. Used as and example because the treated greywater is used for laundry needs as well as toilet flushing.

FastSeptic® aerating septic technology



PercRite® subsurface drip irrigation system.

Contacts: www.cleanwatercanada.com/

Purpose:

Outdoor water efficiency

Description:

A FastSeptic® system supplies oxygen to the septic system and can treat wastewater to a secondary level. The effluent can be treated to a tertiary level by adding UV disinfection.

Potential savings if applied in the RDN:

63% of outdoor water needs and 21% off yearly average when applied to a household.

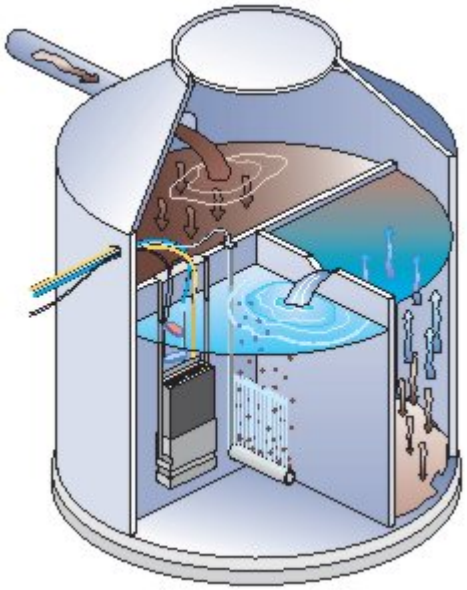
Approx. cost:

$10,000 to 15,000 when combined with a PercRite® drip irrigation system. Price varies depending on level of water treatment needed: standard Class C, secondary or tertiary.

Examples of use:

There are system designs for residential and community scale applications as well as work camps and industrial settings.

Huber technology MembraneClearBox® for septic treatment



Contacts: http://www.huber-technology.com/

Purpose:

Indoor and outdoor water efficiency

Description:

Huber developed a biological treatment plant suitable for a household of up to 8 people. The MembraneClearBox® retrofit system consists of an aeration system and a membrane module. The quality of the treated effluent from the membrane filter is to a level suitable for use as flush water for toilets.

Potential savings if applied in the RDN:

30% if supplies all toilet flushing needs and 20% off yearly water use when applied to a household. More savings if water is also used for outside irrigation.

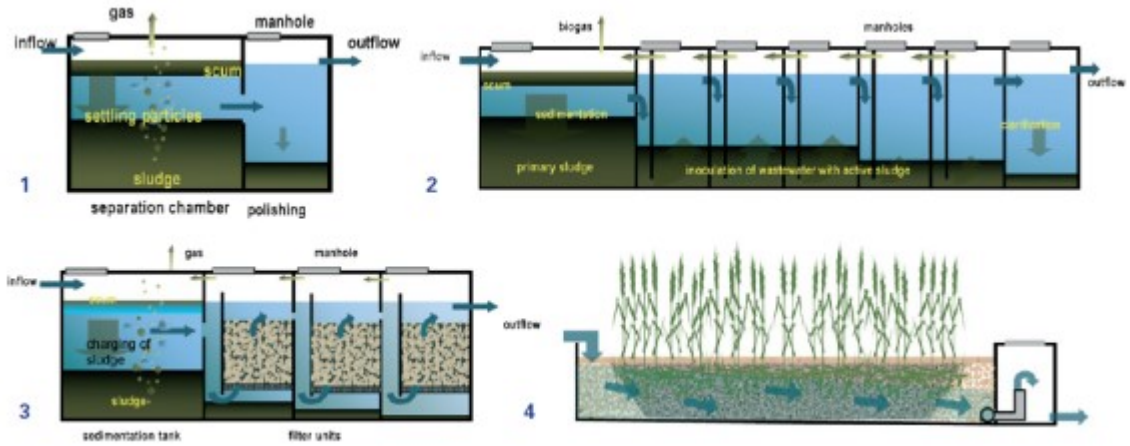
Approx. cost:

$4500

Examples of use:

Installed in existing septic systems or new configurations.

DEWATS "Decentralized Wastewater Treatment Systems" by BORDA, Bremen Overseas Research and Development Association



Main Dewats modules for physical and biological wastewater treatment: 1. Settler 2. Anaerobic Baffled Reactor 3. Anaerobic Filter 4. Planted Gravel Filter

Contacts: http://www.borda-net.org/modules/cjaycontent/index.php?id=29#challenge

Purpose:

Decentralized wastewater treatment and possible outdoor water efficiency.

Description:

BORDA developed a low cost, easy to construct wastewater treatment system. This system is used extensively in Asia and could easily be utilized in the Nanaimo region context.

Potential savings if applied in the RDN:

63% of outdoor water needs and 21% off yearly average when applied to a household. Can also be used for biogas generation.

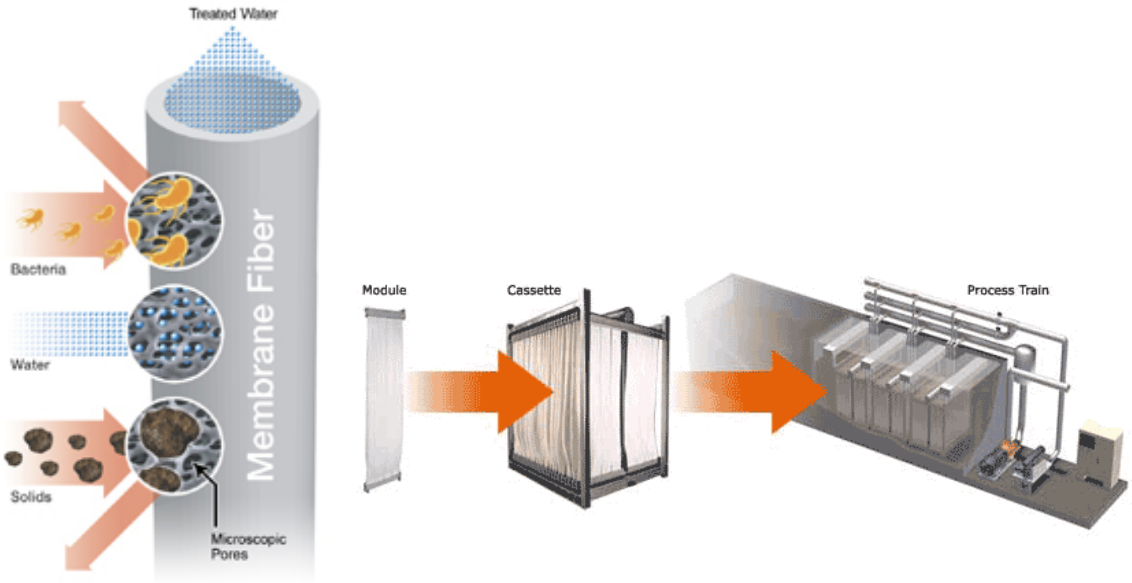
Approx. cost:

Ranges depending on application.

Examples of use:

Used for wastewater treatment from 1-1000m^3 of wastewater flow in situations where cost of technology and sources of trained staff to run wastewater treatment systems are not available. Systems are installed for wastewater treatment of hospitals, commercial, industrial and agricultural industries.

Zenon Zeeweed Membrane Bioreactor Wastewater Treatment



Contacts: http://www.zenon.com/

Purpose:

Wastewater reuse.

Description:

A Zenon Zeeweed Membrane Bioreactor treats all wastewater to a level compatible with reuse for toilet flushing and outdoor watering.

Potential savings if applied in the RDN:

30% indoors and 63% outdoors for a total 41% off yearly average when applied to a household.

Approx. cost:

Depends on scale of application. For the Solaire 770 unit apartment complex in New York, the capital cost was $1,000,000 and maintenance costs are $84,000 per year.

Examples of use:

Dockside Green, Sooke Harbour House, Kingfisher Oceanside Resort, Solaire Apartments, New York, etc.

2.4.3 Precedents

The CRD has a fairly comprehensive list of references for greywater use.

http://www.crd.bc.ca/water/conservation/outdoorwateruse/recycling/greywater.htm

The RDN has a water reuse program that distributes approximately 1/8 of its summer effluent flow to the Morningstar Golf Course for irrigation.

The City of Vernon has a water reuse program that uses effluent from its tertiary treatment plant to irrigate golf courses, seed orchards, forestry and nursery lands. In the near future it plans to include further distribution of recycled water for residential irrigation.

http://www.vernon.ca/services/utilities/reclamation/index.html

In California an applicant for commercial or industrial water allocation must first prove there is no reasonable source of recycled water available.

Irvine Ranch, California has a reclaimed water distribution system that contains 245 miles of pipeline, eight storage reservoirs and 12 pump stations. The volume of water distributed by this system equates to 20% of the total water supply.

Australia is a world leader in water reuse. The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) published in 2006 is a definitive guide for proper water reuse practices. The Guidelines provide comprehensive background information as well as model management, monitoring and communications programs. The cornerstone of these guidelines is the adoption of a Hazard Analysis and Critical Control Point (HACCP) risk management system. This management system provides a secure and trusted framework to guide the distribution of recycled water and maintain public health and support. The vanguard water reuse areas in Australia are located on the Gold Coast.

- Mawson Lakes, a development of 10,000 homes, combines recycled stormwater with recycled wastewater in order to maintain a proper salt concentration. The recycled water will be used for garden watering, toilet flushing, car washing and landscape watering in public open space.
- Pimpama Coomera, a development designed for 120,000 homes, combines rainwater use for all indoor use except cooking and drinking and treated wastewater for toilet flushing and external uses. The use of rainwater for bath and shower is waiting for some study results before implementation over the whole development occurs. Excess wastewater is treated and pumped into a groundwater aquifer for use at a later date. When this water is extracted it will be treated again prior to use. Stormwater is captured in bioswales, wetlands and other environmental infiltration systems.

King County, WA has been using recycled water since 1997 and is currently building two new treatment plants to produce reclaimed water for use. There is a strategy to develop and map a list of potential reclaimed water customers and plan infrastructure to serve their needs.

http://dnr.metrokc.gov/wtd/reuse/

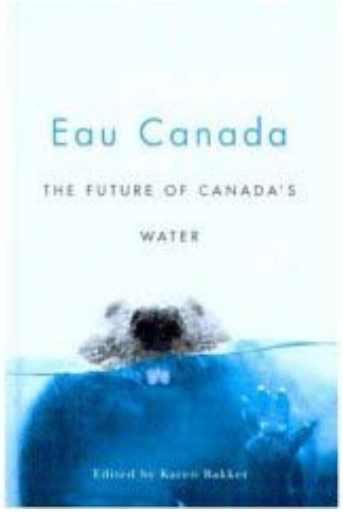
Full version of the potential reclaimed water customer's map can be found here:
http://dnr.metrokc.gov/wtd/reuse/docs/0608PotentialUsers.pdf

2.5 Administration (Metering, Pricing, Billing, Water Restrictions)

2.5.1 Existing

Metering

All homes in the water service areas are metered. RDN staff visit each meter twice a year in person to collect information. A pilot project proposed for 2008 will investigate a radio-based metering system that enables drive-by data collection. The RDN is currently exploring the possibility to connect water meters with the new smart meter technology that BC Hydro is adopting.



A discussion paper by Steven Renzetti, "Are the Prices Right?", in Karen Bakker's new book "Eau Canada" investigates the effectiveness of various Canadian pricing regimes:

- Financially sound – water providers earn enough to pay bills.
- Efficient – informs users of full social costs so users are able to make efficient decisions.
- Environmentally sustainable – promotes conservation and contributes to aquatic ecosystems.
- Equitable – consensus is developing that potable water is a human right; it follows that the cost for potable water should not be an unacceptable burden on low-income households.

Pricing

All customers connected to water systems in the seven water service areas pay the same user fee based on an inclined block rate designed to reward efficient use and promote conservation. The water pricing structure reflects the cost to convey, treat, store and distribute water to service area customers. This **revenue provides funding for the majority of operational costs**. All customers in the water service area also contribute to the water system via a parcel tax fee, which contributes to capital improvements, debt and reserves and a portion of the operating costs.

	Rate per Cubic Meter Per Day Per Household					
Minimum Daily Rate	Up to 0.7	.71 to 1.4	1.41 to 2.1	2.11 to 2.8	2.81 to 3.5	over 3.51
$0.25	$0.86	$1.00	$1.25	$1.50	$2.00	$3.00

Figure 2-1. RDN Incline Block Water Rate

Billing

Bills are sent twice a year: in June for the period from September 15 to May15, and in October for the period from May 15 to September 15. The charges for water are listed in combination with other District charges for garbage/recycling and sewer.

Water Restrictions

There is a staged watering restriction table (next page) applicable to all sprinklers, soaker hoses, and irrigation systems. Drip systems and hand-held hoses with shut-off nozzles are exempt.

A major motivator for this study is to explore other options for managing summer water use. The purpose of water restrictions is to lessen water use during water scarce periods and to limit peak daily demands on water systems. Often the rigid water restriction schedule may not coincide practically with rainfall patterns. As a result, lawns and gardens will get watered twice: once by nature and once by irrigation as dictated by the schedule. There are many more initiatives, other than water restrictions that can protect scarce summer water supplies. Chapter 7 contains a list of short term and long-term implementation recommendations that work towards sustainable water use. All actions listed in this report aim at lowering summer use and as a result, daily peak use as well.

		WATERING RESTRICTIONS			
Water Conservation Level		Level 1	Level 2	Level 3	Level 4
Effective Date		April, May, September and October	June, July and August	As required - See Notes Below	As required - See Notes Below
Frequency		Every other day	Twice per Week	Once Per Week	Comprehensive Watering Ban
Watering Times		6-10AM & 6-10PM	6-10AM & 6-10PM	6-10AM & 6-10PM	
Even Numbered Houses		Even Days	Wednesday & Saturdays	Wednesday	
Odd Numbered Houses		Odd Days	Thursday & Sunday	Thursday	
Decourcey Water System	Houses on Pylades St.	Even Days	Wednesday & Saturdays	Wednesday	
	Houses on Bissel or Ingram	Odd Days	Thursday & Sunday	Thursday	
Surfside Water System		Please Click Here for details			

Figure 2-2. RDN Watering Restriction Schedule

Lowering the Summer Peak

As seen in the graph below, water conservation work focussed on outside use (30% savings) lowers the ceiling for summer peaks by 18% and water conservation work related to indoor use (30% savings) lowers the floor by 12%. If conservation measures are adopted for inside and outside use together, a cumulative savings of 30% can be achieved during the summer peak period and throughout the year.

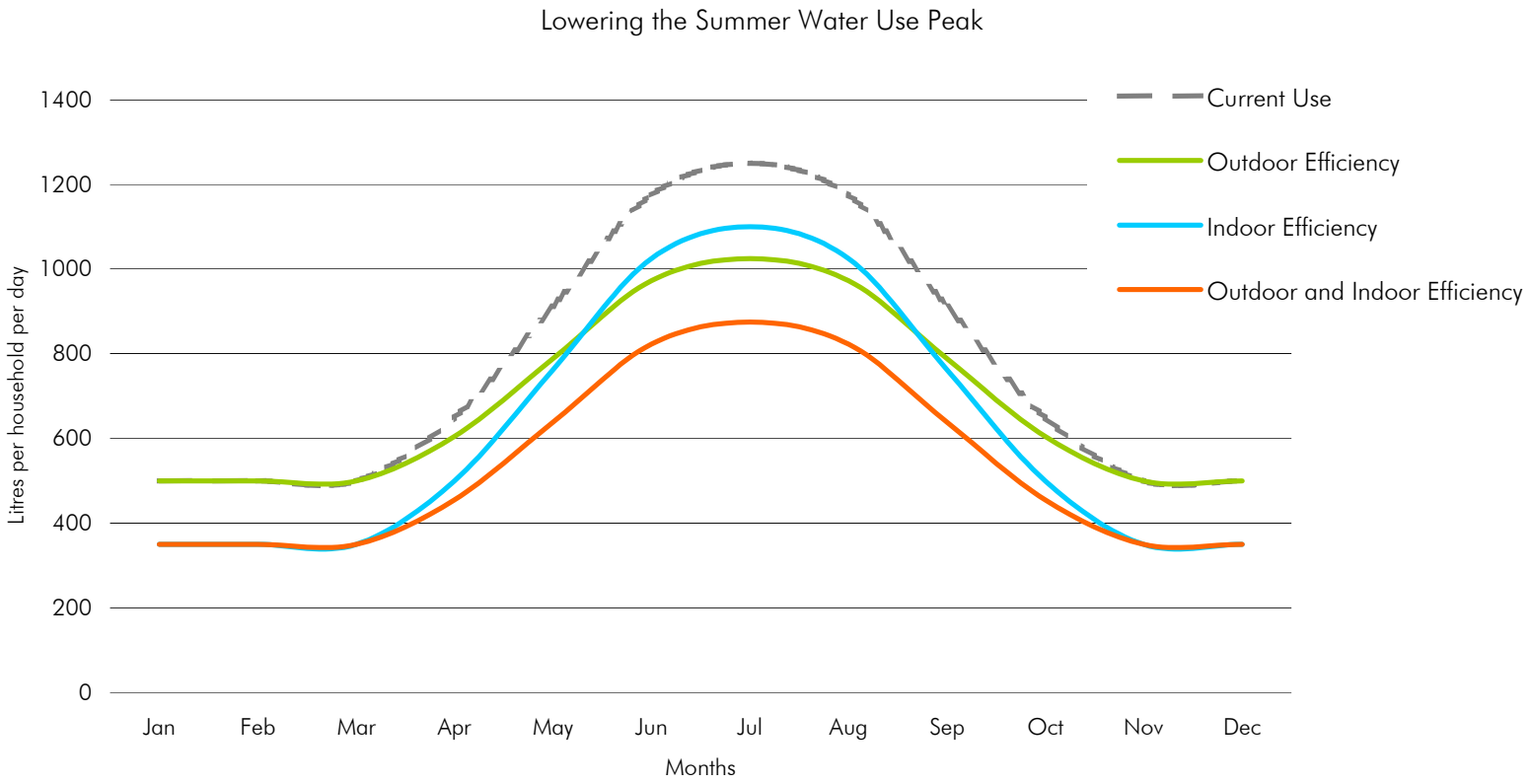
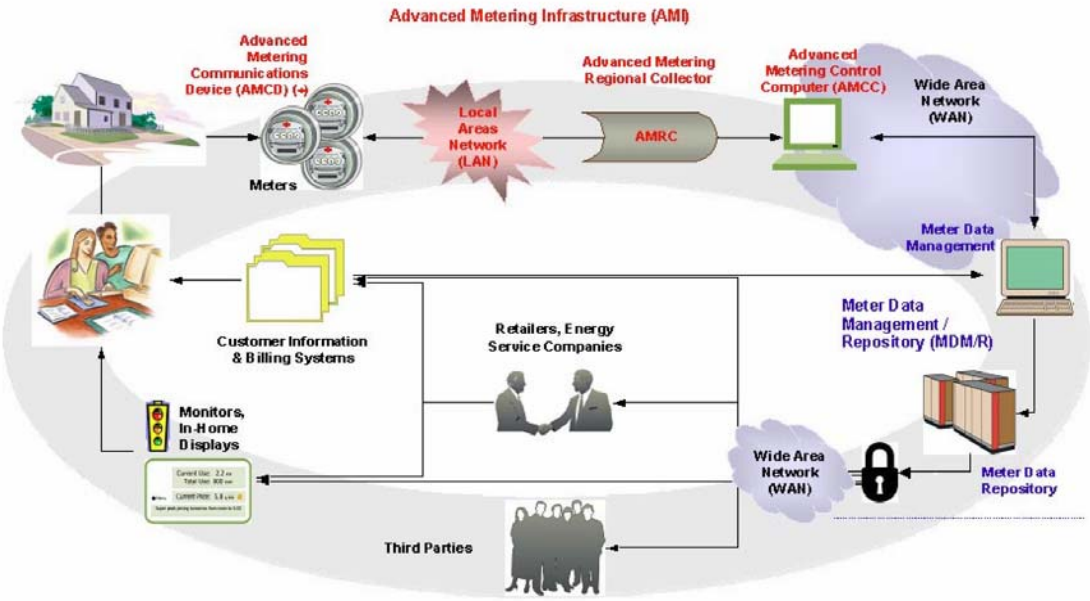


Figure 2-3. Lowering the Summer Water Use Peak

2.5.2 Technology

Smart Meter Advanced Metering Infrastructure, Ontario



Contacts: http://www.energy.gov.on.ca/

Purpose:

Collect and distribute continuous information on energy use. There is potential to include water use data as well.

Description:

Ontario is installing smart meters in 800,000 homes by the end of 2007 and in all homes by 2010. Smart meters track continuous energy use and transmit the information to a central data store. Premier Gordon Campbell pledged to install them in BC in 1.7 million homes within 5 years. Many jurisdictions are interested in accessing water use data through the proposed Smart Meter information network.

Potential savings:

The technology enables peak pricing throughout the day and could help to refine water pricing to manage peaks and overall use.

Approx. cost:

Depends on scale of application.

Examples of use:

Province of Ontario.

2.5.3 Precedents

Metering

In the Region of Durham, Ontario, users read their own meters 3 out of 4 times.

BC Hydro will install Smart Meters in all 1.7 million BC homes by 2012. There is the potential to have these Smart Meters read water usage as well.

Pricing

Irvine Ranch Water District, CA assigns water allocations based on the number of residents, daily weather conditions, landscape square footage and evapotranspiration. Residents can apply for a variance if they desire more water. A link to the allocation calculator:
http://www.irwd.com/Conservation/allocation_calc.php?a=res

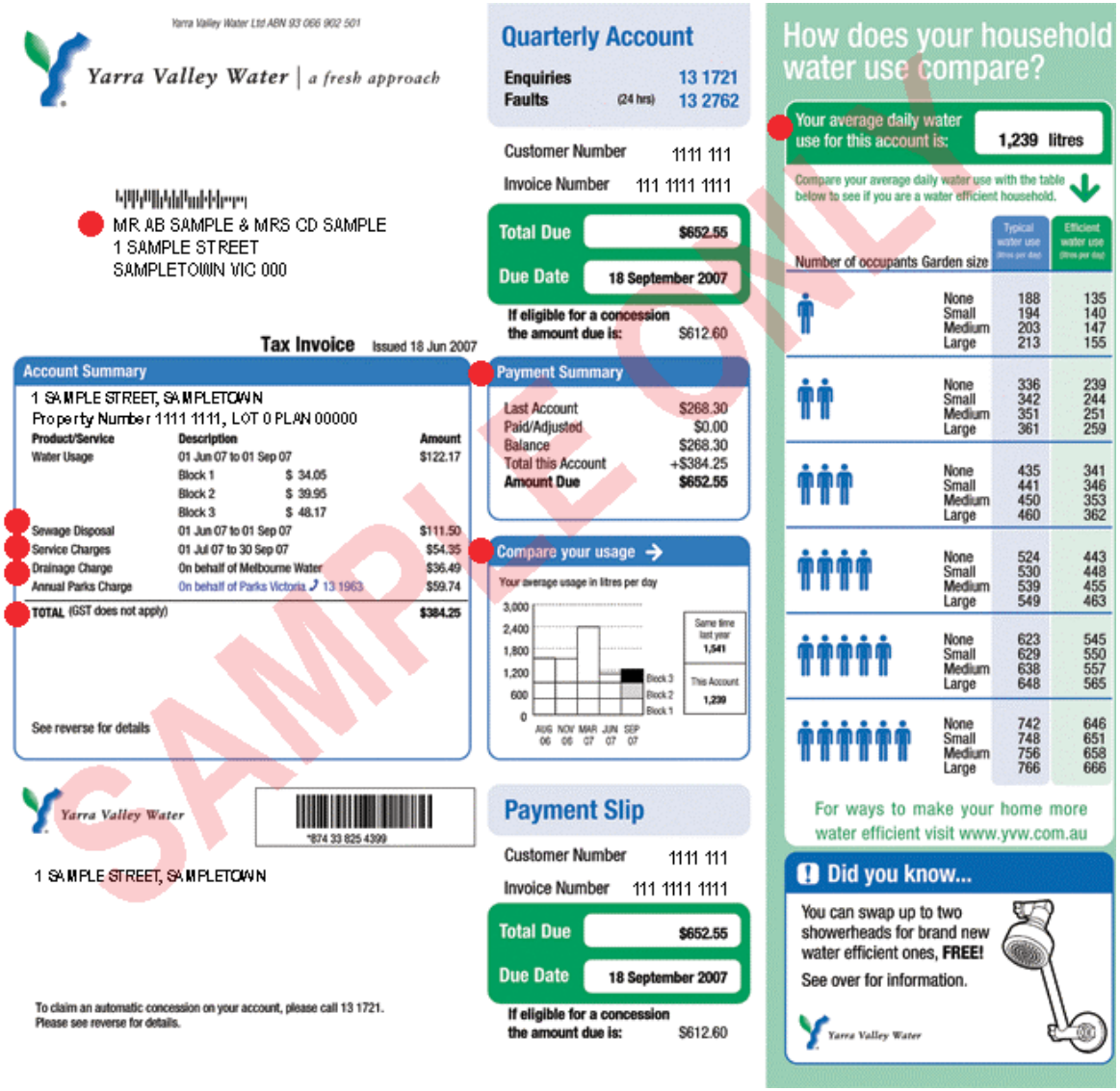
Billing

Yarra Valley Water won the International Water Association (IWA) Communications and Marketing Award in the category of 'customer bills'. Some features of this bill could be emulated on an insert for the RDN. See next two pages.

Water Restrictions

The City of Austin has a water restriction page with helpful questions and answers. http://www.ci.austin.tx.us/watercon/schedulefaq.htm. There is an ET Index posted that gives information on the amount of water needed based on local climate and recent weather conditions. http://www.ci.austin.tx.us/watercon/et-data.htm

Front of the Yarra Valley Water Bill



Back of the Yarra Valley Water Bill

Water saving tips and ideas

Showerhead exchange program

Get your FREE water efficient showerhead!

Yarra Valley Water customers are invited to swap up to two showerheads per household for new water efficient ones FREE!

Register now:

ONLINE: visit **www.yvw.com.au** to register

TELEPHONE: call **13 1721**

Remember to have a copy of your latest bill handy. Terms and conditions apply. For further information visit **www.yvw.com.au**

Account Details

Water Usage from 01/06/2007 to 01/09/2007.

Meter Number	Current Reading		Last Reading		Usage
MBF022863	2,790kL	-	2,676kL	=	114kL

In 92 days you used 114.000 kilolitres, equalling 1,239 litres per day.
One kilolitre (kL) equals 1,000 litres.
Please note: Block tariffs increased from 1 July 2007.

Period	Usage*		Price $/kL		Amount
Block 1					
01/06/07 to 30/06/07	12.760	x	0.8184	=	$10
01/07/07 to 01/09/07	27.720	x	0.8517	=	$23.61
Block 2					
01/06/07 to 30/06/07	12.760	x	0.9601	=	$12.25
01/07/07 to 01/09/07	27.720	x	0.9992	=	$27.70
Block 3					
01/06/07 to 30/06/07	10.415	x	1.4185	=	$14
01/07/07 to 01/09/07	22.625	x	1.4763	=	$33.40
Total	114.000				$122.17

*Rising block tariffs are adjusted according to the days in your meter reading period, and applied on a daily basis.

Sewage Disposal from 01/06/2007 to 01/09/2007.
For the disposal and treatment of sewage from your property. It is based on your water usage and adjusted for seasonal variations.

Usage	Seasonal Factor		Seasonal Volume		Discharge Factor		Sewage Volume
114.000kL	x 0.9989	=	113.876	x	0.900	=	102.489kL

Period	Sewage Volume		Price $/kL		Amount
01/06/07 to 30/06/07	32.306	x	1.0584	=	$34.19
01/07/07 to 01/09/07	70.182	x	1.1015	=	$77.31
Total	102.489				$111.50

Service Charges from 01 Jul 07 to 30 Sep 07.
These are fixed charges per property per quarter, comprising:

Water Service	$15.79
Sewerage Service	$38.56
Total Service Charges	**$54.35**

Drainage Charge from 01/07/2007 to 30/09/2007.
Collected on behalf of Melbourne Water for regional drainage services.

*NAV	Rate	Annual Charge	Quarterly Charge
$18,437.00 x 0.007916	= $145.96	÷ 4 =	$36.49

Parks Charge from 01/07/2007 to 30/06/2008.
Collected annually on behalf of Parks Victoria for parks management.

*NAV	Rate	Charge
$18,437.00 x	0.003240 =	$59.74

***NAV** = Net Annual Value of your property which is capped at 1990 levels.

Additional Information

If you are moving in or out of a separately metered property, we require 48 hours notice to arrange a meter reading at no charge.

Tenants in separately metered properties are liable for water usage and sewage disposal charges only.

Payment Assistance is available if you are having difficulty paying your account, call 13 1721.

Concessions are available to eligible customers. If eligible call 13 1721 with your details. In doing so, you will be authorising us to confirm your eligibility with Centrelink or DVA. This consent will be ongoing and can be revoked by contacting us.

Large Print and Braille accounts call 13 1721.

Hearing Impaired Customers who require a Telephone Typewriter Service, call us on 9872 1199, between 8am and 5.30pm Mon-Fri.

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TIS For language assistance call TIS 13 1450

للحصول على مساعدة باللغة العربية اتصلوا بخدمة الترجمة TIS على الرقم 13 1450

如需语言协助，请电TIS，电话13 1450

Za jezičnu pomoć nazovite TIS 13 1450

Για γλωσσική βοήθεια τηλεφωνήστε στο TIS 13 1450

Per avere assistenza linguistica contattate il Servizio Interpreti Telefonico (TIS) al numero 13 1450

За помощ со јазикот јавете се на TIS на 13 1450

برای دریافت کمک زبانی با تیس TIS به شماره 13 1450 تماس بگیرید

За преводачески услуги позовете TIS на 13 1450

Konuştuğunuz dil konusunda yardım almak için TIS Tercümanlık kuruluşunu 13 1450 No'lu telefondan arayın

Để được giúp đỡ về một ngôn ngữ xin vui lòng gọi TIS qua số 13 1450

Visit our website at www.yvw.com.au or e-mail enquiry@yvw.com.au

Yarra Valley Water is pleased to help you in any matter regarding our water services. If you have any concern, please call us on **13 1721**. If we are unable to resolve the matter you can call the Energy and Water Ombudsman (Victoria) on **FREECALL 1800 500 509**.

How to Pay

Customer Number: 1111 111 **Invoice Number:** 111 1111 1111

Direct Debit your account automatically, call **13 1721** or visit www.yvw.com.au.

Mail a Cheque with this portion of the account to: **Yarra Valley Water, GPO Box 2753, Melbourne VIC 3001.**

Credit Card Payments call **1300 362 332**, 24hrs, 7 days.

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Amount Due	Amount Paid	Date Paid	Receipt Number
$652.55			

Please Note: Overdue Amounts are due and payable immediately.

2.6 Water Consciousness (Public Awareness and Involvement)

The previous sections describe innovative water supply, use and reuse techniques, applications and practices that exist and are common practice around the world. The successful adoption and use of these practices hinges on the ability to inform, involve and motivate people to adjust their water use behaviour. A Sustainable goal is to **remain within limits of the local natural environment and** to be prepared for any changes introduced by **climate change**.

Both the Region of Durham in Ontario and King County in Seattle have initiated water efficiency strategies that have resulted in a drop in water use at the same time population is rising. Each government employs community based social marketing in order to motivate a change in behaviour. The information and technology that is displayed on their websites and presented on their brochures is no different than water efficiency information presented elsewhere. **The integrated communication strategy is the difference**.

A successful community based strategy involves a lot of work at the start for research, surveys, study designs, focus groups and program planning. The early investment pays off because the barriers and benefits of behavioural change are properly assessed and understood. With the correct background information and key goals of the strategy developed, **a public education program changes from an information distribution process to an awareness and involvement campaign that promotes behavioural change**.

The program components and overall strategy develops and changes while the key features of connecting with people and building on commitment continue to provide a momentum for water efficient behaviour. Side benefits are building community and developing lasting networks of social infrastructure. **The development of social infrastructure decentralizes the management of water** and ensures longevity of success because information is not held by just one government department, but is known and shared throughout the region.

Team WaterSmart already promotes community-based awareness and involvement through door-to-door campaigns, water use audits, attending/hosting public events and workshops. This existing program is at an ideal stage of development to be enhanced. **The most important task is to identify and remove any barriers to water conservation** and at the same time reveal and promote the benefits.

Just creating and providing the information or pointing to the technology is not enough. Getting people involved and connected to their local hydrologic landscape is the key to conservation. A simple conversation, workshop session or audit of personal water use can bring someone's water use pattern into perspective. When neighbours get together to discuss water issues and share personal anecdotes, knowledge transfer has great staying power. Turning knowledge to action is the key to a successful public involvement campaign.

2.6.1 Existing Conditions

The Regional District of Nanaimo's WaterSmart website offers comprehensive information on the District Water Service Areas including a description of water sources, system details, water quality lab results, pricing and water restrictions.

There is a "Kids Zone" on the RDN website that contains an interactive web page for children to learn about the water cycle, a water quiz that is specific to the RDN water supply, conservation information and three word search games specific to water terminology and vocabulary.

Team WaterSmart is a public information initiative structured to encourage involvement from all incorporated areas with the region. At this time, Team WaterSmart partners include the Town of Qualicum Beach and the Regional District of Nanaimo. The program is further supported through the sponsorship of the Fairwinds Resort Community. This initiative took shape in 2005 in response to the fact that water consumption in the Oceanside area triples in the summer. Since 2005, Team WaterSmart has hosted 15 workshops on water efficiency including Irrigation, Native Plants, Xeriscape, Garden Design, Drought Tolerant Plants, Rain Barrels and Natural Pest Control. Different brochures referring to many of the workshop topics are produced and distributed. A display booth created in 2006 has attended many community events. Other media for public education includes newspaper articles and advertisements, guest speakers and a television appearance.

Over this past summer, working with the Fairwinds Water Conservation Committee, a goal of reducing water consumption by 10%, led to a targeted door-to-door information campaign. The goal was to visit 50 homes, suggest water conservation measures and study meter readings at a later date to gauge the amount of water use change that was initiated.

Five water audits were also conducted in the summer of 2007. The results showed that many residential irrigation systems were not properly installed. Situations with misaligned sprinkler heads spraying on to hardscapes, unmatched precipitation rates and shared zones for shrubs and lawns are examples of inefficient water use in irrigation.

Team WaterSmart has tried and tested many techniques for public education and involvement, focussing, where possible, on face-to-face communication and gaining personal commitment to adopt conservation measures. There is an extensive, efficient and very helpful Team WaterSmart Program Manual that contains detailed instructions on how to continue the existing Team WaterSmart summer program and where to place future attention for expansion when more funding and staffing become available.

2.6.2 Precedents

The Region of Durham, Ontario and King County, WA have established successful Community Based Social Marketing campaigns at the neighbourhood level based on initial research, surveys and careful design.

http://dnr.metrokc.gov/wtd/waterconservation/

http://www.region.durham.on.ca/works.asp?nr=/departments/works/water/efficiency/waterefficiencyinside.htm

The City of Austin Texas http://www.ci.austin.tx.us/watercon/default.htm offers a comprehensive water conservation program with:

- An ET watering index which provides a weekly watering amount based on current weather data.
- Extensive lawn, garden and irrigation resources, rebates, audits, etc.
- Rebates for a large variety of products: toilets, washing machines, rainwater harvesting systems, commercial processing systems
- Water IQ test to educate people on where their water comes from and tips on how to reduce in comparison to regional supply and use
- Ways to report water waste
- Educational program
- Links to planning, policy and research information

The City of Tampa Bay offers a water use calculator
http://www.tampagov.net/dept_water/information_resources/Saving_water/Water_use_calculator.asp

The Government of Canada offers a water use calculator
http://www.on.ec.gc.ca/reseau/waterCalculator/login_e.html

Redwood City, CA has an extensive section on water conservation education for schools
http://www.redwoodcity.org/publicworks/water/conserve water education.html

The Sunshine Coast Regional District has a water conservation program that is highlighted on the Ministry of Community Services Local Government Department webpage. The SCRD website offers a variety of web ready tools, including self-audits, to help people practice efficient water use.
http://www.scrd.bc.ca/infrastructure_water.html#conservation

2.7 Summary of Water Saving Applications

Below is a summary of the water saving applications listing the relative indoor, outdoor as well as total (year round) water savings potential. These percentages are based on average RDN household use.

Water efficiency applications	Indoor (12 months)	Outdoor (4 months)	Total (12 months)
Lessen outdoor use by landscape and irrigation design and proper water use practice		30%	10%
Lessen indoor use by fixture and appliance retrofit and proper water use practice	30%		20%
Collect rainwater for garden use (one 5000 litre cistern and 1500 square feet of collection)		21%	7%
Collect rainwater for indoor use (one 5000 litre cistern and 1500 square feet of collection)	60%		40%
Collect rainwater for garden use (one 2500 litre cistern and 1500 square feet of collection)		19%	6%
Collect rainwater for indoor use (one 2500 litre cistern and 1500 square feet of collection)	60%		40%
Reuse light greywater outdoors		20%	8%
Reuse greywater indoors (for toilet)	30%		20%
Reuse wastewater outdoors		67%	21%
Reuse greywater indoors progressive (shower and bath and laundry reused for toilet and laundry)	35%		23%

Table 2-1. Summary of Water Saving Applications

3.0 Comparing the Performance of the Techniques

3.1 Method

Based on available technologies and potential policy practices a series of water saving applications and enabling policies were developed as potential elements of a sustainable water use strategy. The matrix in Table 3.1 was used to compare performance. A performance score from 0 to 10 was assigned for 15 individual selection criteria.

For example the technique "Cisterns for outdoor water use" performs fairly well with the criteria "Reduces average water use", but not as well as "Cisterns for toilets and laundry". Therefore a value of 7 is assigned for "Cisterns for outdoor water use" and a value of 9 is assigned for "Cisterns for toilets and laundry". A value of 0 signifies no clear relationship between the water saving element and the selection criteria.

An average score for each element is calculated based on the sum of performance scores greater than 0 divided by the number of performance scores greater than 0. This average performance score enables a prioritization of elements.

The selection criteria assess attributes such as:

- reduction in water use
- reduction in wastewater generation
- ease of implementation for homeowner or builder
- improvement to surface water and/or groundwater
- cost for utility and/or homeowner

The evaluation matrix is listed below followed by an example of prioritized applications and enablers.

3.2 Findings

Table 3-1 Criteria for selection of Priority Water Conservation Techniques

Water Conservation Applications	**Sustainable Expansion of Supply**					**Efficient Use**								**Maximizing Re-Use**								
Score a maximum of 10 for best performance related to criteria. A blank cell means no relationship.	Cisterns for outdoor watering	Cisterns for toilets & laundry	Rainwater / Mains Switch at Cistern, with toilet / laundry/garden use.	Neighbourhood cisterns and centralized rrigation reuse.	Neighbourhood cisterns / SW detention and centralized reuse.	Hydro-zone Landscape Design and Planting	Adequate landscape soil depth and quality	Irrigation Design for Water Conservation	Irrigation Scheduling for Water Conservation	Irrigation Maintenance for Water Conservation	Leak location and repair.	Pressure management both in-home and garden.	Water-saving toilets, showers, laundry, dishwasher.	Composting toilets	In-home greywater reuse from sinks, showers and laundry to subsurface	In-home blackwater treated and reuse to subsurface irrigation.	In-home greywater treatment and dual piping for toilet	In-home greywater treatment and dual piping for toilet / laundry/garden	Treatment and dual piping for toilet / aundry/garden	Wastewater treatment and reuse to oilet/laundry/garden at strata scale evelopment scale.	Wastewater treatment and reuse to oilet/laundry/garden at community node scale.
Selection Criteria																						
1. Reduces average water use.	7	9		7	7	8	8	8	8	7	10	8	9	9	8	8	8	8	8	8	8	
2. Reduces peak (summer) water use.	7	8		8	8	9	9	9	9	8	10	7	7	7	8	8	7	8	8	8	8	
3.Reduces demand for community wastewater treatment / disposal.													9	9	9	9	9	9	9	9	9	
4. Increases rainwater capture and use.	10	10	10	10	10		8															
5.Low need for homeowner knowledge / maintenance.	8	7	7	8	8	6	7	6	6	6	6	6	8	6	6	6	6	6	5	8	8	
6. Easy learning path for trades / professionals.	7	7	7	7	7	7	8	7	7	7	8	8	9	7	7	6	7	7	5	7	7	
7. Proven practice and performance in other jurisdictions	9	9	7			9	9	9	9	9	8	8	9	8	7	4	6	4	4	5	7	
8. Manageable risks to human health and safety.	9	9	7	8	8									7	6	6	6	4	4	6	7	
9. Improves qual.qty. of stream base flows.	7	7	7	7	8	7	9	7	7	7	7	7	7	7	7	6	7	7	7	7	7	
10. Reduces flooding and erosion risks.	9	9	9	9	9	6	8	7	7	7	7	7										
11. Improves qual./qty. of groundwater resource.	7	7	7	7	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
12. Encourages compact and low energy use communities.				9	9																10	
13. Affordable for home purchaser / developer.	7	6	6	8	8	7	6	7	6	6	6	7	7	6	6	5	6	5	4	6	7	
14. Affordable for water utility capital.																					6	
15. Affordable for operations by homeowner or utility.	8	8	8	8	8	8	8	7	8	7	6	7	9	8	8	7	8	7	5	7	6	
Total Score (up to 10 points per criterion=150 max.)	95	96	75	96	99	74	87	74	74	71	75	72	81	81	79	72	77	72	66	78	97	
Number of Categories	12	12	10	12	12	10	11	10	10	10	10	10	10	11	11	11	11	10	11	11	13	
Average score	7.9	8.0	7.5	8.0	8.3	7.4	7.9	7.4	7.4	7.1	7.5	7.2	8.1	7.4	7.2	6.5	7.0	7.2	6.0	7.1	7.5	

Water Conservation Techniques	**Water Administration**											**Water Consciousness**						
Score a maximum of 10 for best performance related to criteria. A blank cell means no relationship.	Monthly meter reading in pilot area	Monthly meter reading across water service areas	Smart water meters in collaboration with BC Hydro.	Increased incline block pricing with summer premium.	Water base allocation with premium pricing for overages	Added pricing of intrinsic (environmental) value of water.	Bill inserts provide water use comparison with targets.	Internet interface allows water users to calculate water use scenarios.	Graphic representation of water use is provided each month.	ET based irrigation is exempt from water days.	All irrigation controllers are required to be ET-based	Door-to-Door education visits.	Water audit programs	School WaterSmart program.	Year-round water coordinator	Add summer co-op position.	Web-based community of interest. .	On-going public awareness and involvement campaigns.
Selection Criteria																		
1. Reduces average water use.	7	7	8	9	9	9	7	7	7	8	8	9	10	7	10	9	7	9
2. Reduces peak (summer) water use.	7	7	8	9	9	9	7	7	7	8	8	9	10	7	10	9	7	9
3.Reduces demand for community wastewater treatment / disposal.																		
4. Increases rainwater capture and use.																		
5.Low need for homeowner knowledge / maintenance.	8	8	8	9	9	9	8	7	8	6	6	7	9	8	8	9	6	7
6. Easy learning path for trades / professionals.										6	6	7	7		8	8	7	8
7. Proven practice and performance in other jurisdictions	8	8	7	8	8	5	7	7	7	7	7	9	9	8	9	9	8	8
8. Manageable risks to human health and safety.												9	10	8	8	8	8	9
9. Improves qual./qty. of stream base flows.												8	8	9	9	9	7	8
10. Reduces flooding and erosion risks.										7	7	8	9	8	9	8	8	9
11. Improves qual./qty. of groundwater resource.					8	9						8	8	8	8	8	8	9
12. Encourages compact and low energy use communities.																		
13. Affordable for home purchaser / developer.	8	8	8	6	6	6		8		4	4	8	9	9	9	9	9	9
14. Affordable for water utility capital.	7	6	6				6	6	6			6	6	6	6	7	6	6
15. Affordable for operations by homeowner or utility.	7	6	7	8	6	6	6	8	8	6	6	7	7	7	6	7	7	7
Total Score (up to 10 points per criterion=150 max.)	52	50	52	49	55	53	41	50	43	52	52	95	102	85	100	100	88	98
Number of Categories	7	7	7	6	7	7	6	7	6	8	8	12	12	11	12	12	12	12
Average score	7.4	7.1	7.4	8.2	7.9	7.6	6.8	7.1	7.2	6.5	6.5	7.9	8.5	7.7	8.3	8.3	7.3	8.2

Prioritized applications	
1	Neighbourhood cisterns / SW detention and centralized reuse
2	Water-saving toilets, showers, laundry, dishwasher
3	Cisterns for toilets & laundry
4	Neighbourhood cisterns and centralized irrigation reuse
5	Cisterns for outdoor watering
6	Adequate landscape soil depth and quality
7	Rainwater / Mains Switch at Cistern, with toilet / laundry/garden use
8	Leak location and repair
9	Wastewater treatment and reuse to toilet/laundry/garden at community node scale
10	Hydro-zone Landscape Design and Planting
11	Irrigation Design for Water Conservation
12	Irrigation Scheduling for Water Conservation
13	Composting toilets
14	Pressure management both in-home
15	In-home greywater treatment and dual piping for toilet / laundry/garden
16	In-home greywater reuse from sinks, showers and laundry to subsurface
17	Irrigation Maintenance for Water Conservation
18	Wastewater treatment and reuse to toilet/laundry/garden at strata scale development scale
19	In-home greywater treatment and dual piping for toilet
20	In-home blackwater treated and reuse to subsurface irrigation
21	In-home greywater /blackwater treatment and dual piping for toilet / laundry/garden

Table 3-2 Prioritized Applications

Prioritized enablers	
1	Water audit programs
2	Year-round water coordinator
3	Add summer co-op position
4	Increased incline block pricing with summer premium
5	On-going public awareness and involvement campaigns
6	Door to Door education visits
7	Water base allocation with premium pricing for overages
8	School WaterSmart program
9	Added pricing of intrinsic (environmental) value of water
10	Monthly meter reading in pilot area
11	Smart water meters in collaboration with BC Hydro.
12	Web-based community of interest
13	Graphic representation of water use is provided each month
14	Monthly meter reading across water service areas
15	Internet interface allows water users to calculate water use scenarios
16	Bill inserts provide water use comparison with targets
17	ET based irrigation is exempt from water days
18	All irrigation controllers are required to be ET-based

Table 3-3 Prioritized Enablers

3.3 Summary

The process of evaluating the techniques reveals bias in the person performing the assessment and it also brings to light unique characteristics for different techniques. Two examples of these unique characteristics are:

- Toilet and fixture retrofits are a foolproof technique to reduce water use and wastewater generation. Once the new fixtures are installed, there is little maintenance needed and no requirement for specialized knowledge. Water savings occur all year and lessen the summer peak.
- Both landscape design and irrigation installation require knowledge, experience and regular maintenance. These techniques have the best chance of success if there are standards and guidelines to follow and if there are occasional audits to monitor performance.

The prioritization of techniques helps to guide the implementation timeline for each strategy. High performance scores suggest that an early implementation is appropriate because of ease to achieve water saving results. Low priority scores hint at a preferred later implementation date due to higher cost of technology that might decline overtime, (e.g. weather stations for irrigation control), or a water saving technology that requires time before support from the general public develops (e.g. wastewater recycling). There was no weighting of any of the criteria.

The prioritization of techniques also reveals challenges that might result in the promotion and application of certain water saving techniques For example: In the priority list above there are landscaping and irrigation applications and enablers at the bottom of the list. They received low scores due to knowledge and maintenance issues as well as cost. When considering a campaign to introduce landscape and irrigation techniques, it's important to involve knowledgeable professionals and offer promotions or rebates to remove any cost disincentives.

4.0 Assessment of Implementation Strategies

4.1 Approach to Implementation

Chapter 2 and Chapter 3 introduce and compare the techniques that facilitate efficient water use and the enablers that promote water sustainability. This chapter explores the benefits of three alternative strategies that can be combined in a sequential pattern to form sustainable water use program.

4.1.1 Strategy 1: Business as Usual with Extra Education

Strategy 1 is complete with actions that can be taken and instituted over the next two years. This strategy focuses on education to increase the adoption rate of water conservation applications. Implementing these measures will motivate efficient water use behaviour and motivate building, landscaping and other trade professionals to think about water conservation in their daily work.

4.1.2 Strategy 2: Remove Barriers and Promote Efficient Use

Strategy 2 is composed of incentives, promotions, helpful standards and guidelines and a relaxation of regulatory impediments. The timeline for these actions are in the next two to four years, overlapping slightly with the education programs of strategy 1, that have raised the awareness of the possibilities for conservation. One goal of strategy 2 is to develop sufficient pilot projects and case studies that offer empirical evidence in support of the effectiveness of various conservation measures. With proven successes to lead the way, long-term sustainable water use will be much easier to promote and achieve.

4.1.3 Strategy 3: Strive for Minimal Hydrologic Footprint

Strategy 3 is the ultimate destination. In order to properly calibrate this option the RDN should investigate and decide upon a future water extraction amount. Following the principles of the 'Soft Path' to water sustainability and in line with the USEPA Water Conservation Plan framework, it would be proactive for the RDN to inventory and assess a realistic amount of available water without compromising the natural environment. This number will help refine the long-term strategy and make possible the development of a comprehensive water management plan. The focus of Strategy 3 is regulation.

4.2 Methodology for Strategy Evaluation

There are a number of factors and influences that lead to the adoption of sustainable water use practices. This study explores the connection between the substantive water management actions that can be taken (efficient use indoors and out, rainwater harvesting and wastewater reuse) and the motivators or enablers (education, incentives, pricing, metering and other regulations) that influence the adoption rate these practices.

There are proven case studies to show that many innovative water supply, use and reuse practices are possible and successful. The technology is available. The main difference in each strategy is the combination of different enablers that support, promote and even require sustainable water use practice. The percent savings afforded by various water management actions are derived from a literature review as well as constraining physical parameters. (e.g. roof and cistern size in the case of rainwater harvesting).

The percent adoption rate applied to each water management action refers to the power of the enabler to motivate action. It is a variable that can be adjusted and has been arbitrarily assigned based on ranges of water use reductions gleaned from the literature, presentations and local government websites. Examples are:

- The Region of Durham and King County Washington experienced a 30% reduction in outdoor water in areas visited by a door-to-door information campaign.
- Yarra Valley Water Authority in Australia witnessed a 20% reduction in water use from 2000 to 2005. A large portion of that reduction occurred after a graphically engaging and information rich water bill was introduced as part of a broad range of water conservation initiatives.
- The City of Kelowna initiated a 20% reduction in overall water consumption between 1998 and 2006. Their success is largely attributed to metering, adjustments in water rates and a 'Get Water Smart' program that involves extensive public education and social marketing.
- The Capital Regional District first introduced water conservation programs in the 1990's. Since that time, total water use has not increased while population continues to rise.

It can be hard to separate out the adoption rate for individual water management actions when they are most commonly part of an integrated water management campaign. Nonetheless, assumptions can be made in terms of the increased level of influence that can be gained from web-based information, door-to-door visits and development regulations.

This study examines the potential affect of each strategy as the population in the Regional District of Nanaimo grows in the next 25 years at a rate of 2% per year on average. Growth rate and population increase numbers are sourced from BC Statistics. These tentative implementation strategies were presented and reviewed in a focus group workshop. For results see Section 6.

Innovative technologies and applications that may seem cost prohibitive now will likely become more affordable and easier to implement with time. Health Canada has just published the Canadian Guidelines for Household Reclamation of Water for use in Toilet and Urinal Flushing as a draft for consultation. Guiding policy is on the way to enable innovative water management.

4.2.1 Water Savings possible by each method

- Outdoor water use

Table 4-1. Typical outdoor irrigation water use savings forms a basis for the possible water savings associated with efficient outdoor water use. Because each strategy in this study includes a variety of measures to curb outdoor water use a potential outdoor water use reduction of 30% is used in the strategy evaluation.

Method	Savings in outdoor irrigation water use
Improved irrigation technology:	
Automatic shutoff nozzle on hose	5-10%
Rainfall shutoff device on automatic irrigation systems	5-10%
Drip irrigation system	25-75% (of non-lawn irrigation)
Water-wise landscape planning and design	20-50% (potentially 10 100%)
Reduced lawn area	15-50%
Use of native and low-water-use plants	20-30%
Comprehensive audit	10-15%
Source: Vickers, A. (2001). Handbook of Water Use and Conservation: Homes, Landscapes, Business, Industries, Farms. Amehurst, Massachussets: WaterPlow. pp.152-200.	

Table 4-1. Typical outdoor irrigation water use savings. Referenced from Brandes, Oliver M. et al Thinking Beyond Pipes and Pumps – Top 10 Ways Communities Can Save Water and Money. pp. 27.

- Indoor water use

The Region of Durham is currently studying the water savings associated with the introduction of water efficient appliances and toilets (as well as energy) in the Hamlet development in the Town of Ajax, Ontario. The study involves 176 homes, half outfitted as water efficient homes and the other half as builder standard. The interim report states a 22.3% reduction in water use with the water efficient homes.

http://www.region.durham.on.ca/departments/works/water/efficiency/ECinterimreport.pdf

The Sunshine Coast Regional District offers an aggressive bathroom retrofit campaign and has studied the affect of retrofitting the bathroom fixtures in 15 of 38 homes in a community. The post installation homes showed a drop of 23.5% in daily use.

Based on these two studies a potential overall water use reduction of 20% and a 30% reduction for indoor use only are used in this strategy evaluation.

- Rainwater Harvesting

The main determiners of water available through rainwater harvesting are monthly precipitation rates, roof size and the storage size of a cistern.

The ability to save water (or replace traditional sources of water from a well or water service main) in an indoor use context is mainly a function of the roof size. For indoor use, water is consistently used throughout the year and storage is temporary. The size of storage is an influencing factor only in the summer months when there is less rain consistently.

Saving water in an outdoor use context is mainly a function of cistern or storage size. Outdoor use requires lots of water when there is little rain and often the amount stored at the beginning of the summer is the majority that will be available all summer.

Because of the variability of rainwater harvesting configurations, a variety of roof size and cistern size combinations are used in the strategy evaluation.

Table 4-2 Rainwater Harvesting Options, details percent water savings possible based on climate data from the Environment Canada weather station located near Nanaimo, BC together with an assumed summer outdoor use pattern of 750 litres per home per day for 4 months of the year and an indoor use pattern of 500 litres per home every day of the year.

Cumulative water savings are always greater when the rainwater is used indoors rather than outdoors. The cistern is constantly being depleted and refilled for indoor use. With outdoor use the cistern is filled with the winter rains and depleted in the summer when there is little chance of refilling. Outdoor water savings rely on how much water you can store for a one time summer use. Indoor savings rely on how many times you can empty and refill a cistern throughout the year. As revealed in the bottom line of the table, savings in indoor water use with a smaller cistern is 3 times the savings in outdoor water use. Even as the cistern size increases, the amount of cumulative water saved over the year with indoor use is still almost 1.7 times greater than that saved with outdoor use.

Rainwater Harvesting Options					
Roof size (square feet)	1500	1500	1500	2000	2000
Cistern Size (litres)	2500	5000	10,000	10,000	20,000
Percent of indoor water supplied	60%	60%	60%	70%	74%
Percent of outdoor water supplied	19%	20%	26%	32%	43%
Ratio of water saved indoor/outdoor	3.2	3.0	2.3	2.2	1.7

Table 4-2. Rainwater Harvesting Options

- Wastewater Reuse

The main determiners of water use reductions possible through greywater or wastewater reuse are based on the amount of water used indoors and water required outdoors as well as the water use pattern inside the home.

The table 4-3 Wastewater Reuse Options, found on the next page, details percent yearly water savings possible based on the indoor use habits pictured in the Figure 4-1 Residential Indoor Water Use pie chart, together with an assumed summer outdoor use pattern of 750 litres per home per day and an all year indoor use pattern of 500 litres per home per day. Savings in outdoor water use can only be realized during the summer months, whereas savings in indoor water use are possible year round.

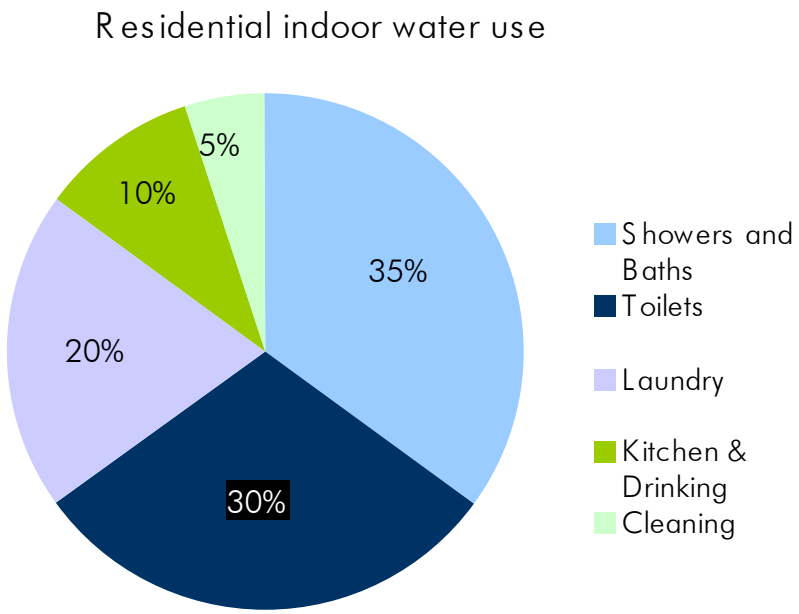


Figure 4-1. Residential Indoor Water Use
Source: Environment Canada Freshwater Web site. Available at: www.ec.gc.ca/water/images/manage/effic/a6f7e.htm

Wastewater Reuse Options	Potable water use reductions
Light greywater outdoors (sourced from shower and bath)	8%
Light greywater indoors (shower and bath reused for toilet) *Or replace toilet with composting toilet	20%
Wastewater outdoors (all indoor use reused outdoors)	22%
Light greywater indoors progressive (shower and bath for toilet and laundry)	23%

Table 4-3. Wastewater Reuse Options

4.2.2 Indoor vs. Outdoor Use

Using water saving techniques indoors has the ability to conserve more water on average over the year than using outdoor water saving techniques for 4 months in the summer. Of course the extent of indoor vs. outdoor water savings will vary depending on the amount of water used in each context. The two examples below assume a summer outdoor use pattern of 750 litres per home per day and an all year indoor use pattern of 500 litres per home per day.

In terms of efficient use, curbing summer outdoor water use by 30% may lessen the summer peak more, but using 30% less water indoors still lowers the summer peak and affords consistent savings throughout the year with an overall greater water savings. A graphic representation of the difference in savings is shown in the graph below. Daily water use averaged over the year incorporating a 30% indoor efficiency is 720 litres, while a 30% outdoor efficiency results in an 845 litres daily average water use.

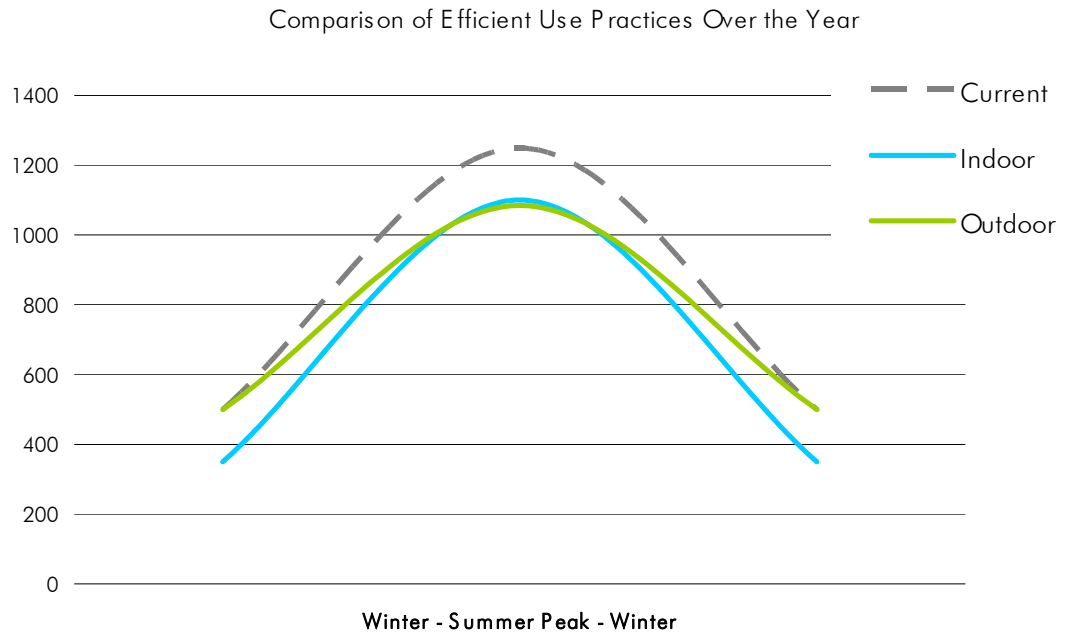


Figure 4-2. Comparison of Efficient Use Practices

In the context of rainwater harvesting, greater water savings is afforded by consistent use throughout the year as opposed to large volume use for a short season. The volume of water available in the summer is limited by cistern size as the main source of water, rain, is available mainly over the wet winter. A small number of summer rains will supplement the available water, but this amount is negligible compared with the needs of irrigation. The graph below shows the difference between indoor and outdoor water savings possible by collecting rainwater on a 1500 square foot roof and storing it in a 5000 litre cistern. If rainwater is used indoors only, 60% of indoor use is supplied by this rainwater collection system. If rainwater is used outdoors only, 19% of outdoor water needs are supplied by the same configuration.

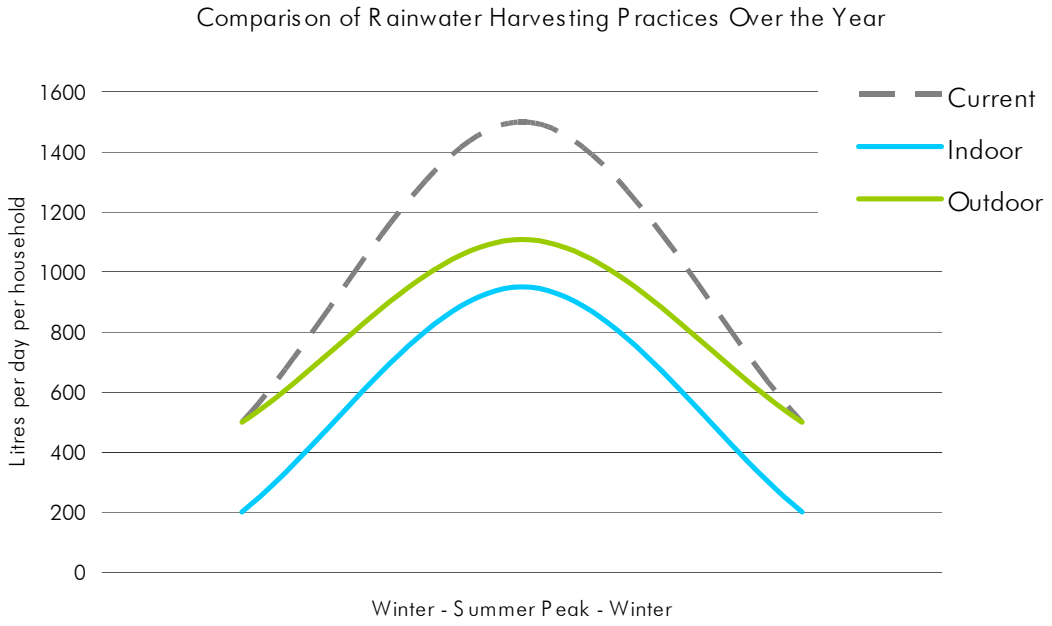
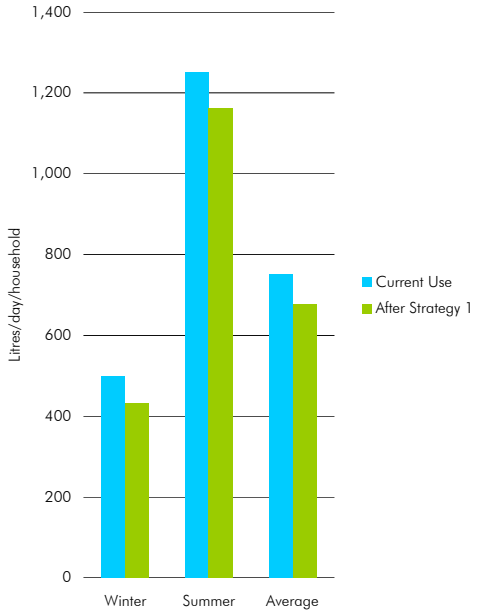


Figure 4-3. Comparison of Rainwater Harvesting Practices

4.3 Strategy 1: Business as Usual with Extra Education

Comparison of Daily Water Use Strategy 1



Please note the current use values do not directly reflect existing conditions. They are modeled on values of 500 litres per home per day in the winter months and 1250 per home per day in the summer months. In fact the current average is 810 litres per day.

Under Strategy 1 introducing the concept of rainwater harvesting and water reuse applications, plus enhancing the general understanding of efficient water use practice are the main methods of implementation.

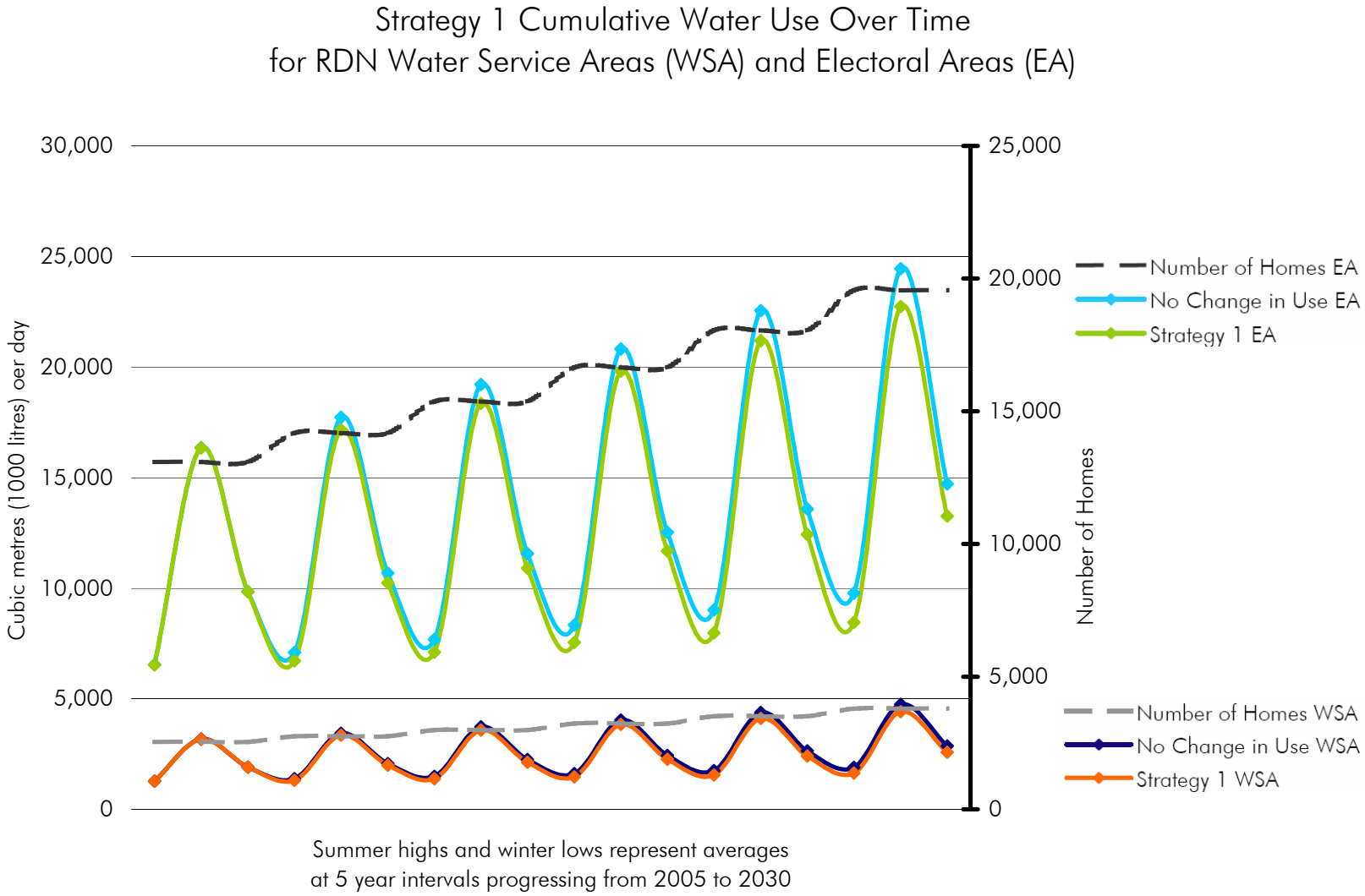
This strategy assumes an adoption rate of 40% for indoor and outdoor efficiencies, 10% for rainwater harvesting and 0% wastewater reuse. That means that throughout the area targeted for conservation, 40% of the population would need to practice indoor efficiencies, 40% of the population would need to practice outdoor efficiencies and 10% would also need to use some form of rainwater harvesting. It could be that 40% of the population practices both indoor and outdoor efficiencies and 10% of this group also harvests rainwater.

Alternatively, if the average irrigated area dropped by 30% the same water savings could also be achieved with current practices.

The District would promote these practices with residents, builders and developers as well as landscape and irrigation professionals and focus attention on summer water use. The District would encourage residents to be more mindful of water use by providing interactive website calculators to help people estimate their bills, plan conservation efforts and inititiate adjustments to water pricing, offer brochures on water efficient landscape and irrigation design and as well as weekly guidance on sprinkling rates and times.

Team WaterSmart would install a variety of water efficiency calculators on its website and continue the door-to-door campaign and themed water conservation efforts. The suggestion for 2008 is to continue with a “Rain Gauges” theme.

With use patterns of 2004 as a reference point, the associated water savings if this strategy is followed through till 2031 are expected to be in the range of 13% for winter use, 7% for summer use with an average water savings of 10%.


Strategy 1 Cumulative Water Use Over Time
for RDN Water Service Areas (WSA) and Electoral Areas (EA)
30,000
25,000
20,000
15,000
10,000
5,000
0
Cubic metres (1000 litres) oer day
25,000
20,000
15,000
10,000
5,000
0
Number of Homes
Number of Homes EA
No Change in Use EA
Strategy 1 EA
Number of Homes WSA
No Change in Use WSA
Strategy 1 WSA
Summer highs and winter lows represent averages
at 5 year intervals progressing from 2005 to 2030

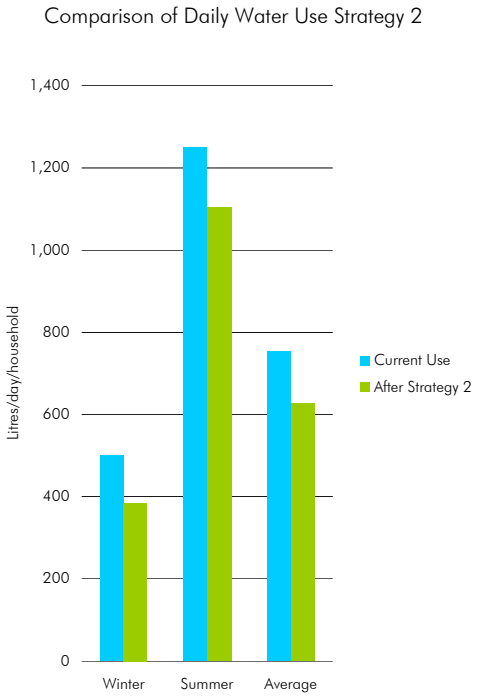
4.3.1 Single-family dwelling

Residents would have a larger source of information to help them evaluate a change in water use. Water savings result mainly from self-motivation and impetus from the adjusted pricing regime.

4.3.2 Larger-scale development

Developers would have the same source of information to help them evaluate a change in water use. Water savings result mainly from self-motivation and impetus from the adjusted pricing regime.

4.4 Strategy 2: Remove Barriers and Promote Efficient Use



Please note the current use values do not directly reflect existing conditions. They are modeled on values of 500 litres per home per day in the winter months and 1250 per home per day in the summer months. In fact the current average is 810 litres per day.

Strategy 2 is an approach that attempts all it can without requiring rainwater harvesting, wastewater reuse or larger capital projects. It is an intensively collaborative approach and requires the hiring of a Water Efficiency Coordinator in order to lead public awareness and involvement campaigns, work with District staff and liaise with other government officials to push various water efficiency initiatives forward.

This strategy assumes an adoption rate of 65% for indoor and outdoor efficiencies, 20% for rainwater harvesting and 1% wastewater reuse (in larger developments with professional maintenance and management). That means that throughout the area targeted for conservation, half of the population would need to practice indoor efficiencies, half would need to practice outdoor efficiencies, 15% would need to practice both and 20% would also need to use some form of rainwater harvesting. It could be that 40% of the population practices both indoor and outdoor efficiencies and 20% of this group also harvests rainwater. That would leave another quarter of the population to practice only outdoor efficiency and again another quarter to practice only indoor efficiency.

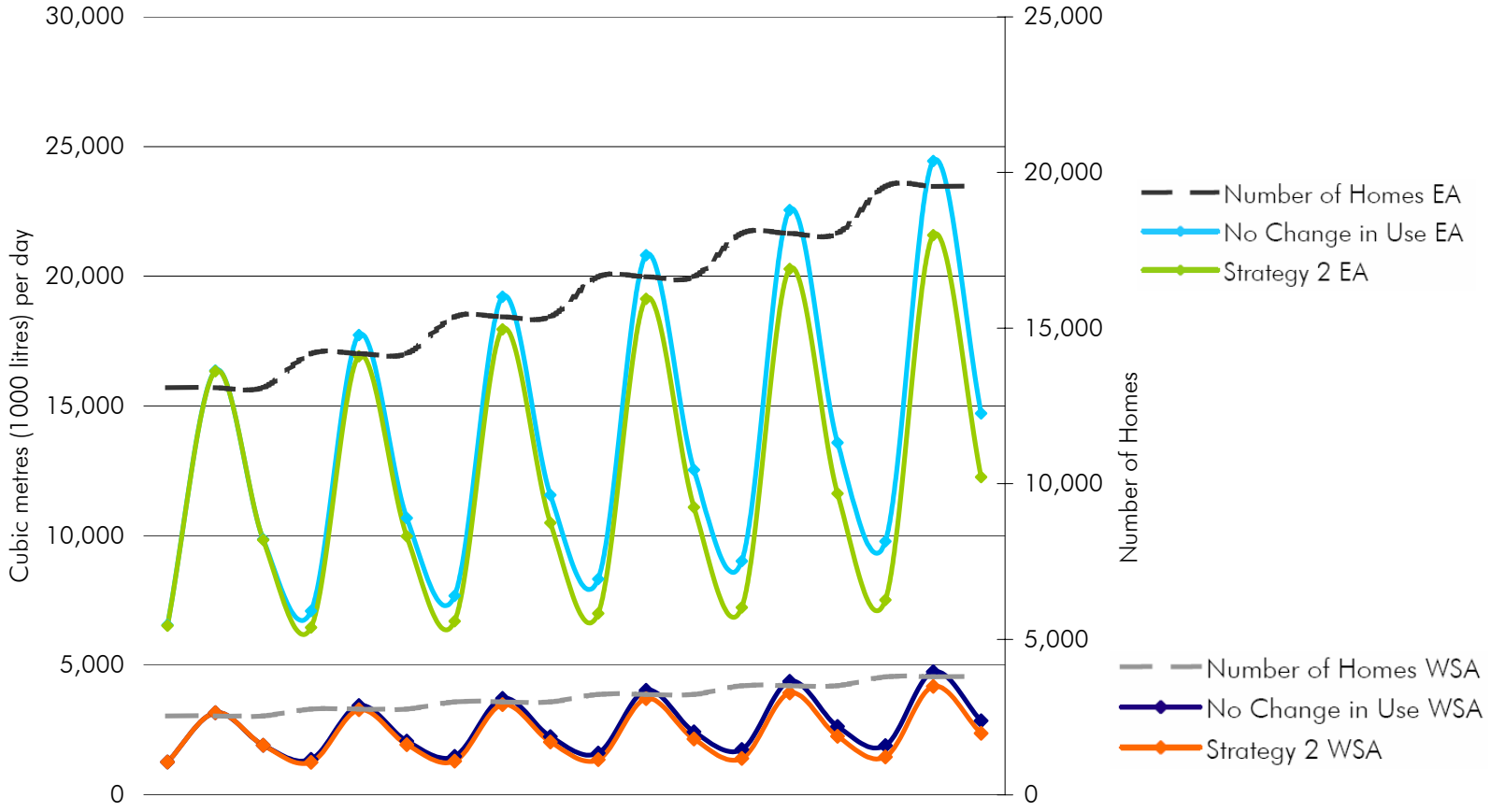
Alternatively, if the water savings inherent in Strategy 1 were already achieved, then continuing with the actions of Strategy 1 and dropping the average irrigated area by 33% would produce the same water savings.

Guidelines for rainwater harvesting and water reuse would be developed but not enacted in regulation. Staff time would be spent developing Best Management Practices and standards, but the lack of regulations mean staff would not be busy with the administration of applications, permits and monitoring of installations. The rainwater harvesting and water reuse guidelines would help developers and individual builders build sustainably, increase public understanding and inspire confidence that the District is taking steps to proactively address water issues.

Citizens within the RDN would become more aware of the ecosystem they live in and how their water needs impact the aquatic needs of their non-human neighbours. Local water inventories, more frequent meter readings and the presentation of this data in combination with weather patterns would help people conceptualize the seasonal water flow and climate changes. The concept of the available amount of water for this region would be developed and understood.

With use patterns of 2004 as a reference point, the associated water savings if Strategy 2 is followed through till 2031 would be in the range of 23% for winter use, 18% for summer use with an average water savings of 17%.

Strategy 2 Cumulative Water Use Over Time
for RDN Water Service Areas (WSA) and Electoral Areas (EA)



Summer highs and winter lows represent averages
at 5 year intervals as time progresses from 2005 to 2030

4.4.1 Single-family dwelling

Rebates and discounts on fees associated with the installation of rainwater harvesting and systems would push a number of homeowners the extra step towards implementing the system. Residents would purchase water efficient new dishwashers and laundry machines thanks to the rebates and many households would retrofit their bathroom with dual flush toilets; low flush showerheads and sink aerators. Some homes would consider converting to composting toilets as the water savings are larger and the impact on wastewater is less.

- The equilibrium house from the Echo Haven resort near Calgary achieves a 72% reduction in water use by using rainwater and efficient fixtures and appliances.

4.4.2 Multifamily development/Strata/Resort

Where zoning permits, landowners would use the water savings of rainwater harvesting and water reuse with organized maintenance and management as the tools needed to bring higher densities to their properties. The new 'green ethic' would inspire more buyer interest to the developments that are designed with nature and offer living with a lighter hydrologic footprint. The secondary savings is that population expansion with new wastewater technologies does not require expansion of the sewer. The use of onsite package sewage treatment plants for larger developments is currently under review by the RDN Liquid Waste Management department.

Another 'green' selling point could be that many developments offer tertiary sewage treatment and use Constructed Treatment Wetlands to return treated effluent as well as stormwater to local stream systems. Buyers are attracted mainly to the natural aesthetic benefits.

All larger developments purchase ET sensors to efficiently guide their irrigation.

- The Sooke Harbour House in Sooke, BC achieves a 70% reduction in water use by recycling all their wastewater for toilet flushing and drip irrigation.

4.4.3 Local Area (Neighbourhood/Water Service Area)

Neighbourhoods and water service areas would work together to connect all the irrigation systems to a shared local weather station. The RDN offers discounts to each homeowner if they are connected to an ET sensor and the technology that only requires one wire to pass through all irrigation valves would make the cost savings of a group effort attractive. As prices for individual ET sensor/weather stations decrease it may be cost effective to promote these units for individual households. With more frequent meter readings

residents are readily able to compare landscape and irrigation design and water use statistics with their neighbours.

4.4.4 Large Context (New Village Centre/Nodal Area/Municipality)

Integrated rainwater collection systems and Package Sewer Treatment Plants (PSTP) would be the cornerstones of the new green communities in the region. These systems could reduce the need for large-scale groundwater extraction as rooftop rainwater harvesting takes care of many needs. Sewage expansion may be reduced as the local Package Sewer Treatment Plants efficiently treat the water and use local wetlands, streams or groundwater recharge wells rather than outflow pipe systems.

The perk of extra densities for water efficient developments helps focus population growth towards compact complete centres and makes the water wise infrastructure affordable.

- Pimpama Coomera in Australia achieves an 84% reduction in water use by benefiting from rainwater tank and wastewater recycling.

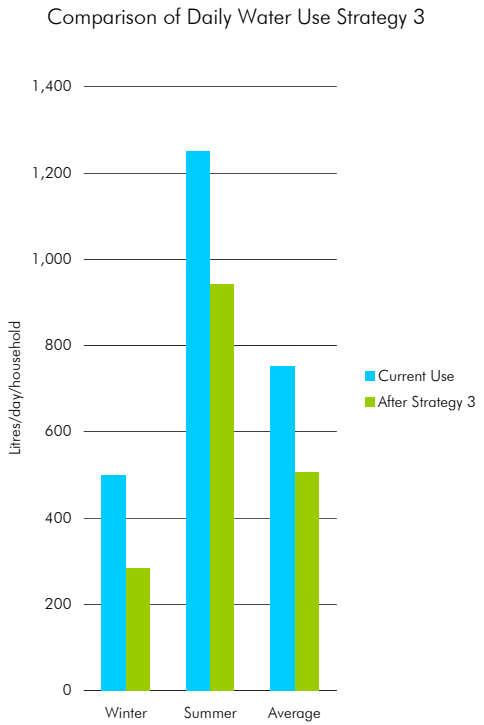
4.4.5 Industrial/Commercial/Institutional

Industrial and commercial developments could receive rebates for their water related processing. A rebate program partnership could inspire large savings in the hotel and restaurant industry. Industrial enterprises could install in-house water recycling systems and institutional buildings could partner with the RDN to develop showcase sites for rainwater harvesting and wastewater reuse applications.

- The Sylvia Hotel in Vancouver achieves a 47% reduction in water use by retrofitting its bathroom fixtures and laundry machines.
- A car washing business in Beijing achieves a 75% reduction in water use by recycling the water it uses. 15 cars can now be washed with the same amount of water that was previously needed for 4 cars.
- *Gray Line bus tours of Seattle, WA installed a water recycling system and reduced its per bus water use from 1,300 litres to 100 – a savings of 92%
- *Also in Seattle a professional tunnel car wash reduced water use from 260 to 60 litres per vehicle – a savings of 77%

*Sourced from CRD Water Conservation FAQ sheet.

4.5 Strategy 3: Strive for Minimal Hydrologic Footprint



Please note the current use values do not directly reflect existing conditions. They are modeled on values of 500 litres per home per day in the winter months and 1250 per home per day in the summer months. In fact the current average is 810 litres per day.

Strategy 3 is an approach whereby the RDN educates, employs incentives and regulates residents in the region to be as water responsible as they can be. Strategy 3 supports climate change adaptation because it strives to draw the least amount of water from the environment and promotes an increase in decentralized storage. In this strategy, or later phase in water sustainability, the District requires the adoption of landscape and irrigation standards, insists on rainwater harvesting installations and requires wastewater reuse for larger developments. Non-efficient water use is monitored and discouraged with the help of a ticketing bylaw.

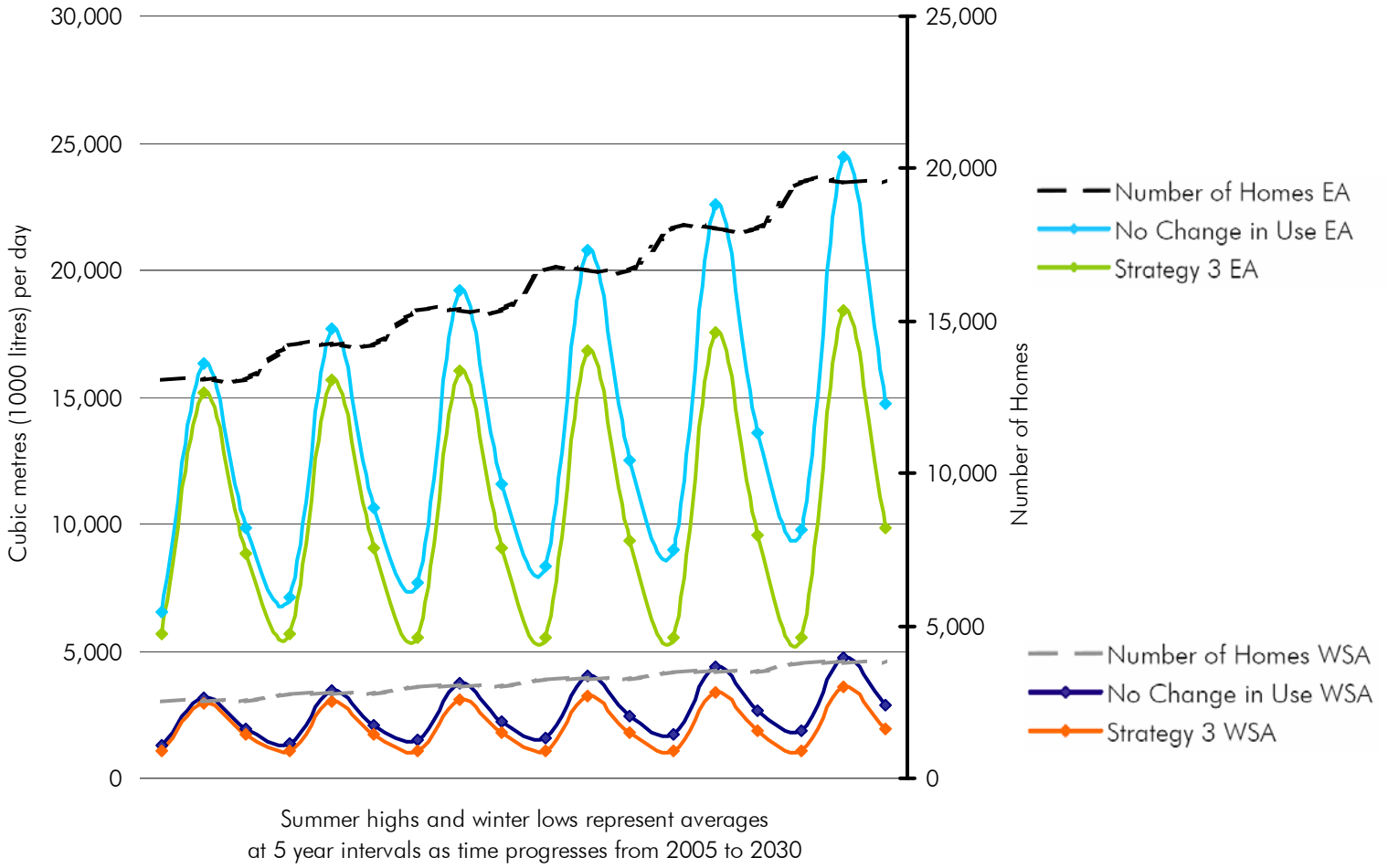
This strategy assumes an adoption rate of 75% for indoor and outdoor efficiencies, 50% for rainwater harvesting and 10% for wastewater reuse. That means that throughout the area targeted for conservation, half of the population would need to practice indoor and outdoor efficiencies, the rest would need to practice one or the other. As well half of the population would need to practice some form of rainwater harvesting and 10% would need to practice some form of wastewater reuse.

Alternatively, if the water savings inherent in Strategy 2 were already achieved, then continuing with the actions of Strategy 2 and dropping the average irrigated area by another 45% would produce the same water savings.

This strategy is able to ensure certain efficiencies in the large water use practices of toilet flushing, garden use and other non-potable needs. The new sustainable water policies promote integrated planning for new village centres and nodal areas.

With use patterns of 2004 as a reference point, the associated water savings if Strategy 3 is followed through till 2031 would be in the range of 43% for winter use, 25% for summer use with an average water savings of 33%.

Strategy 3 Cumulative Water Use Over Time
for RDN Water Service Areas (WSA) and Electoral Areas (EA)



4.5.1 Single-family dwelling

The new policies would decentralize water distribution to a certain extent by requiring homeowners to be more self-sufficient through rainwater collection, wastewater reuse and efficient use. The guidelines ensure residents are gardening in accordance with the most current knowledge and practice. Gardening is not limited but landscaping and irrigation principles are practically applied for easier implementation.

Rebates and discounts on fees associated with the installation of rainwater harvesting and greywater/wastewater reuse systems would push a number of homeowners the extra step towards implementing the system. Water savings possible are similar to Strategy 2 and adoption is more prevalent now that it is required.

4.5.2 Multifamily development/Strata/Resort

Larger developments could actualize great savings in water use. Water savings possible are similar to Strategy 2 and adoption is more prevalent now that it is required.

4.5.3 Local Area (Neighbourhood/Water Service Area)

New neighbourhoods would be built with integrated rainwater capture and centralized irrigation systems. Some water service areas are constructing central wastewater treatment centres that serve recycled water for irrigation needs. Water savings possible are similar to Strategy 2 and adoption is more prevalent now that it is required.

4.5.4 Large Context (New Village Centre/Nodal Area/Municipality)

All new communities would integrate rainwater collection systems and modular wastewater treatment centres. Municipalities offer recycled water as an option for non-potable needs such as irrigation or toilet flushing. Water savings possible are similar to Strategy 2 and adoption is more prevalent now that it is required.

4.5.5 Industrial/Commercial/Institutional

Any water intensive larger scale activity would be encouraged to prove some form of water recycling to gain a business license. Many industrial businesses would be motivated to set-up shop close to each other to share recycled water and benefit from the cost savings. Water savings possible are similar to Strategy 2 and adoption is more prevalent now that it is required.

4.6 Comparison of Strategies

The three strategies can be seen as steps along the way to progressive water management practice.

Outdoor and Indoor Techniques	Strategy 1	Strategy 2	Strategy 3
Efficient Use	40%	65%	75%
Rainwater Harvesting	10%	20%	50%
Wastewater Reuse	0%	1%	10%
Total Water Savings	**14%**	**24%**	**36%**

Table 4-4. Comparison of Strategies

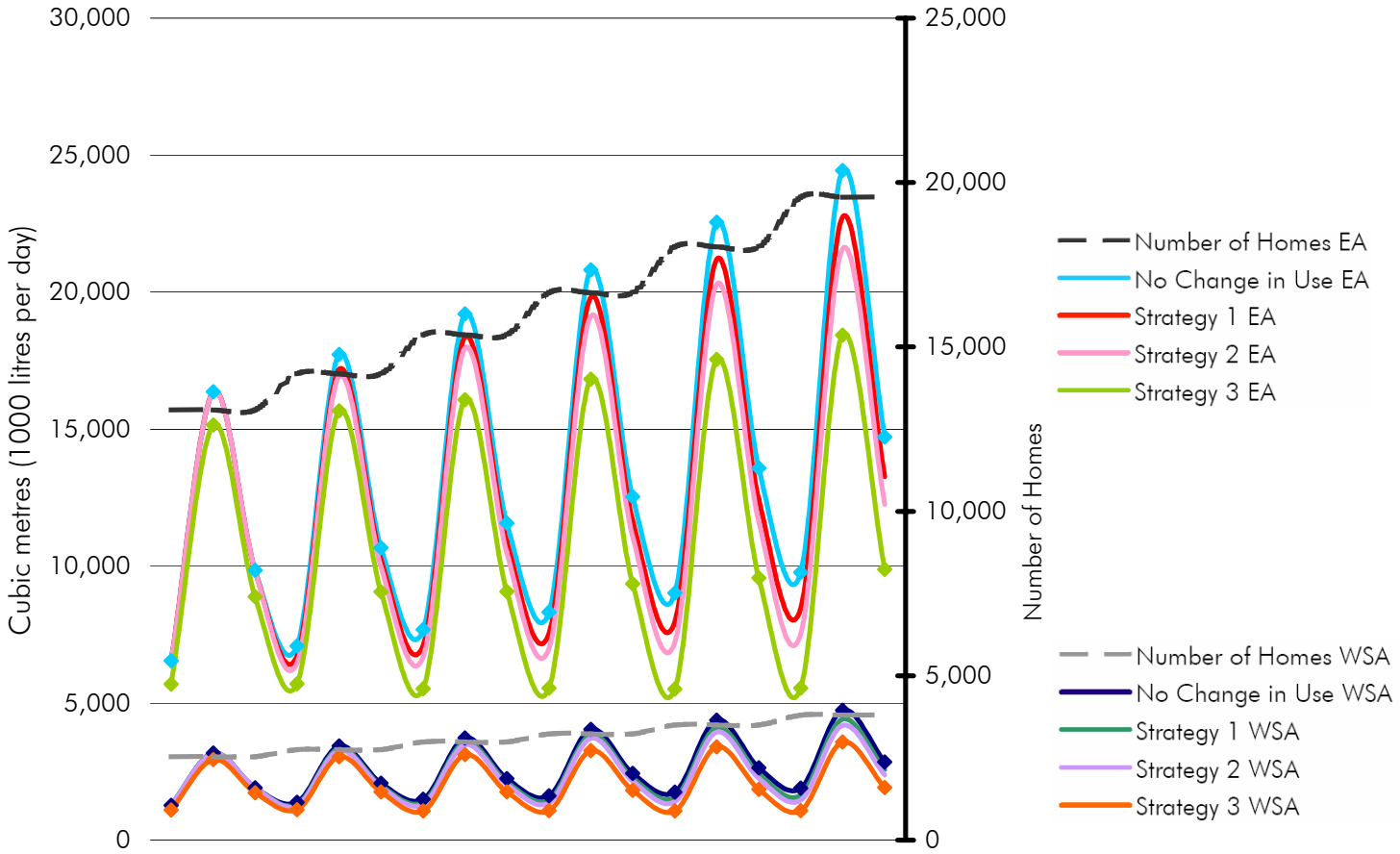
Current practice needs a little enhancement and refocus to implement Strategy 1(Business as Usual with Extra Education). A natural next step is to make it easier for homeowners, developers and businesses to employ water use practices that are common in other areas of the world.

Strategy 2 (Remove Barriers and Promote Efficient Use) opens the door to current international water use practice and calls upon the mentorship of the RDN to promote innovative water management, develop land use guidelines and work with other agencies to create policy that enables further water efficiency.

Strategy 3 (Strive for Minimal Hydrologic Footprint) builds upon the work accomplished in Strategies 1 and 2 and defines a certainty of water use practice and associated savings through the implementation of water use regulations. The technology is ready for Strategy 3 to be adopted at the present time, but there needs to be more pilot studies to garner public support and evaluate the effectiveness of progressive water use measures in the region.

The table below compares how each strategy responds separately to the implementation principles. By rolling out each strategy sequentially, Straegy1 (next two years), Strategy 2 (2 to 4 years) and Strategy 3 (4+ years), a cumulative savings of 33% places the resulting water use graph in between the lines of Strategy 2 and 3.

Comparison of Strategies: Cumulative Water Use Over Time
for RDN Water Service Areas (WSA) and Electoral Areas (EA)



Summer highs and winter lows represent averages
at 5 year intervals progressing from 2005 to 2030

1. Years 1 and 2

Build on existing success and water management work with Strategy 1 during the next 2 years. Elements of Strategy 2 can be developed over the next 2 years while awareness is building with the public and development community. During this time increased collaboration with regulating authorities that are connected with water use, can enable the development of policy that makes water centric development the preferred method. The hiring of a Water Efficiency Coordinator during this time is essential for the development of an integrated approach to sustainable water use management.

2. Years 2 through 4

The policies, regulations and program initiatives that drive Strategy 2 would be introduced to a population aware of the possible water saving techniques that, thanks to strategy 2, are now easy to implement. This same population could be ready to take advantage of incentives and promotions that increase the uptake of water conscious behaviour. Public Awareness and Involvement campaigns such as Community Based Social Marketing will continue to evolve and motivate the public towards water efficiency.

3. Years 4 and beyond

After 4 years of education and 2 years of lessened regulatory hurdles coupled with promotions, the requirements within Strategy 3 to achieve certain water efficiency in the design and construction of new developments will represent a reinforcement of common practice. Just as installing high R-value insulation and retrofitting a home with a heat pump makes good sense to minimize energy use today; the water efficient behaviour of tomorrow will include the installation of dual-flush (or composting) toilets, efficient fixtures, an irrigation system with weather station and for a larger portion of the population – a rainwater harvesting system.

It will take time for water efficient behaviour to increase in acceptance. New construction and landscaping standards will need to be developed and promoted. Many homes and properties will need some form of retrofit or renovation. And some water saving applications such as wastewater reuse and recycling need time, further development and perhaps a better appreciation of a limited water supply before adoption becomes significant. It may take many years to experience the full potential savings of Strategy 3 (33%). It is conceivable and plausible to achieve a water steady state as depicted in the "trumpet" graph below over the next 20 years. This steady state of water consumed as population increase is possible with a 33% reduction in water use on average across the region.

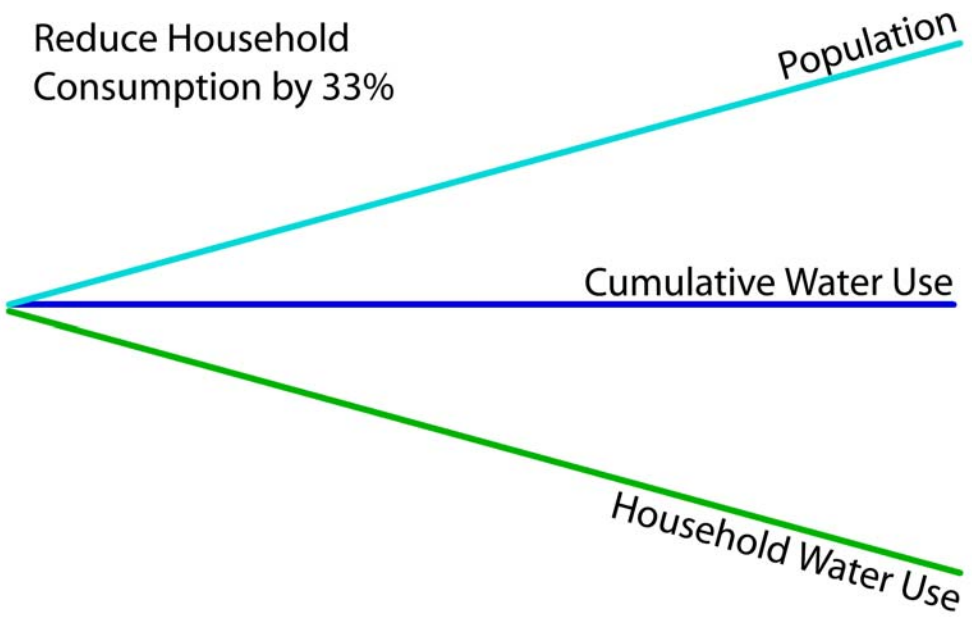


Figure 4.4 Water Consumption in RDN Electoral Areas over 25 Years

Specific actions that the RDN can take to achieve a 33% reduction in overall water use are listed in Chapter 7.0 Summary and Recommendations.

It is important to emphasize that this study only suggest changes in consumption in reference to existing consumption patterns. It is uncertain what impact the existing water use patterns are having on the hydrological environment. Perhaps the existing water use practices are not contributing to a decline in local hydrology, but it could be the case that existing consumption patterns are already negatively impacting the region's natural hydrology. It is important to conduct an assessment of how human water use practices affect the natural hydrological systems. There are recommendations for actions to achieve this assessment in the Drinking Water / Watershed Protection Plan.

5.0 Three Illustrative Models

5.1 Context

Three illustrative models were created to explore the relationship between water use and development patterns: large lot rural, rural by design and compact community.

All models differ in lot configurations and how they use water but share a number of common features:

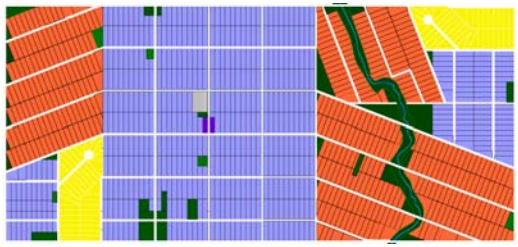
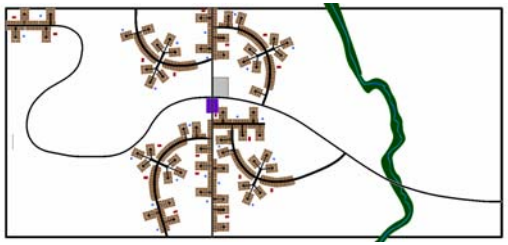
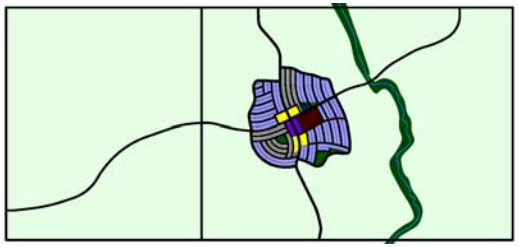
1. 1000 residential units
2. Population of 2300 people
3. Elementary school
4. Local commercial
5. Environmentally sensitive area is 5-10% of the settlement
6. Parent parcel is 1150 Ha (2300m X 5000m)
7. Low flow bathroom fixtures in all units

5.2 Land Use Pattern and Infrastructure

These are simplified development patterns that represent three lot configurations in a spectrum of possibilities. The motivations driving the examination of these three lot configurations are:

- Rules and regulations governing sewage disposal
    - The Ministry of Community Services offers funding to support the construction of community sewer systems to local governments only if their zoning defines the minimum lot size that supports on-site septic as 1hectare. An exploration of the merits of 1 ha lots with on-site septic is intriguing as it represents one end of the development spectrum.
- Development ease for construction and profit with the sale of single-family dwelling lots
    - Subdividing and developing single-family dwelling lots with wells and onsite septic or community water supply and septic is fairly straightforward and routine. Application processing is fairly predictable and the profit margin is worthwhile. Is this the type of development that should be the easiest to complete? Is this the best use of the land? How can water conservation be applied in this context?
- Smart Growth extols the virtues of compact communities for many reasons and the RDN Regional Growth Strategy promotes this form of land use
    - Compact Community development can be costly in terms of money as well as the time needed to receive regulatory approval. How much better is this form of development and what is possible in terms of water conservation? Is it to the betterment of the public to streamline regulatory approvals and reward this form of development?

Below is a table describing the specifics of lot configurations and infrastructure analyzed for these land use models.

Land use pattern	Land use specifics	Infrastructure
 Large Lot Rural	• 1 Ha min. lot size • 50m X 200m lots • 20m road ROW • fee simple with no common lands	• individual wells • individual septic systems • irrigate 20% of the lot • no other water conservation techniques
 Rural by Design	• 900 m2 lot size • 22.5 m x 40m lots • 20 m road ROW • bareland strata with common lands	• community wells and aerating septic technology placed in common lands to serve clusters of 50 units. • irrigate 40% of lot, but save 30% with proper irrigation design and management • 5000 litre rainwater tank capture system to serve toilets, laundry and outdoor
 Compact Community	• 50% are 660 m^2 lot size, 20m x 33m lots • 25% of units are townhome at 30 unit per hectare • 25% of units are apartment at 60 units per hectare • 50 apartments above the main street commercial • 16m road ROW • mix of tenure	• community wells, reservoir • central Package Sewage Treatment Plant (e.g. Zenon) and recycling back to toilets and outdoor (excess from MF) • irrigate 40% of lot, 20% of townhome and 30% of apartment lots, but save 30% with proper irrigation design and management • 2500 litre rainwater tank capture system on single family, used for laundry and outdoor

5.3 Water Conservation Performance

As summary of water conservation performance reveals that the Compact Community is most efficient with the Rural by Design approach a close second.

	Large Lot Rural	Rural by Design	Compact Community
Average water use (litres per day per household)	2,363	374	333
% reduction from RDN Water Service Area average use (810 litres per day per household)	0%	54%	57%
Capital cost per unit with rainwater harvesting for non-potable use	$28,000	$21,725	$25,525

5.4 Development Yield Performance

The Compact Community conserves the most amount of land and uses the least amount of road.

	Large Lot Rural	Rural by Design	Compact Community
Unit count	1000	1000	500 SFD, 250 TwnHse, 250 Apt
Development footprint	1150 Ha	112.5 Ha	56 Ha
% of parent parcel developed (undeveloped)	100% (0%)	9.8% (91.2%)	4.9% (95.1%)
Total Length of road	41.7 km	13.7 km	10 km
Road cost per unit	$29,190	$9,590	$18,108

The road costs for the Large Lot Rural and Rural by Design are both estimated with a local open shoulder roadway. The Compact Community includes a mixture of local open shoulder roadway, minor urban collector with infiltration swale, and local urban road with infiltration swale and streetlights.

All costs given are Class D (Order of Magnitude) Estimates for comparison purposes only. Readers are cautioned against using these estimates for any other purpose.

5.5 Infrastructure Cost Comparison

Area serviced		Water						Sanitary						Reclaimed Water				
		Wells, treatment and reservoirs	Distribution incl. service connections	Hydrants	Engineering and contingencies	**Rainwater harvesting (non-potable)	Total water cost	Treatment and disposal incl. reservoirs	Collection system	Manholes	Engineering and contingencies	Total sanitary cost	Total water and sewer cost	Reservoir and storage	Distribution incl. service connections	Engineering and contingencies	Total reclaimed water cost	Total cost with reclaimed water system
No DCCs paid. Infrastructure not connected to existing systems	Large Lot Rural						10,000					18,000	28,000					
	Rural by Design	1,090	2,550	360	1,000		5,000	6,000	3,000	375	2,350	11,725	16,725					
	Compact Community	1,100	4,100	500	1,425		7,125	3,300	2,800	300	1,600	8,000	15,125	2,450	3,850	1,600	7,900	23,025
	Rural by Design *(with rainwater harvesting)*	1,090	2,550	360	1,000	5,000	10,000	6,000	3,000	375	2,350	11,725	21,725					
	Compact Community *(with rainwater harvesting)*	1,100	4,100	500	1,425	2,500	9,625	3,300	2,800	300	1,600	8,000	17,625	2,450	3,850	1,600	7,900	25,525
DCCs paid. Infrastructure connected to existing systems	Rural by Design (no *rainwater harvesting)*	2,967	2,550	360	1,000		6,877	3,631	3,000	375	2,350	9,356	16,233					
	Compact Community (no *rainwater harvesting)*	2,967	4,100	500	1,425		8,992	3,631	2,800	300	1,600	8,331	17,323					

Rainwater harvesting saves on average, 334 litres per day for the Rural by Design Community and 122 litres per day for the Compact Community.

Costs for water treatment and reservoirs as well as sanitary treatment and disposal are derived from an average value for DCCs from the City of Nanaimo, Lantzville, Parksville and Qualicum Beach. Average DCCs include costs for single-family and multifamily (MF) developments. (MF with an average gross building floor area of 1500 square feet or 140 square metres)

5.6 Sustainability Performance

If we assess each development model in terms of sustainability indicators, the compact community is by far the leader.

	Large Lot Rural	Rural by Design	Compact Community
Water conservation	-	+	+
Wastewater reduction	-	-	+
Energy conservation	-	-	+
GHG performance	-	-	+
Habitat conservation	-	+	++
Walking / biking community	-	-	+
Healthy community	-	-	+
Transit friendly	-	-	++
Affordable and diverse	-	-	+
Aging in place	-	-	+
Potential for eco-industry	-	+	+

Analysis of the three different models shows the Compact Community design as a leader in sustainability and slightly more efficient in water use. The Rural by Design approach is a close second in terms of water conservation, undeveloped land and road length. This small lot rural landscape lacks the other sustainability features that a Compact Community can offer. The Large Lot Rural development pattern leaves little for the community in terms of public land and sustainability features, this development pattern has the possibility to be more or less water consumptive depending on landscaping preference.

In terms of sustainable water use, the water use practices that influence consumption patterns are, in order of intensity:

a. ***Amount of irrigable area.*** The amount of irrigation needed was calculated at 1 inch per week over the irrigable area. Before employing any outdoor water conservation techniques the water needs for each configuration are:

   i. Large Lot Rural needs 5.806 cubic metres per day in the summer (irrigable area is 0.16 ha – or 20% of the lot)

   ii. Rural by Design needs 1.045 cubic metres per day in the summer (irrigable area is 0.029 ha – or 40% of the lot)

   iii. Compact Community needs 0.671 cubic metres per day in the summer (average irrigable area is on average 0.018ha – or 40% of the SFD, 20% of the townhouse and 30% of the apartment lots)

   Lot size has a large influence on summer water use.

b. ***Rainwater harvesting.*** The water saving potential of rainwater harvesting was assessed for the single-family homes in the Rural by Design and Compact Community development models, based on yearly precipitation patterns as recorded at the Environment Canada weather station near Nanaimo, BC.

   i. Large Lot Rural could easily adopt a rainwater harvesting practice similar to the Rural by Design approach. The model assumes no rainwater harvesting.

   ii. In the Rural by Design development model, rainwater harvested from a 1,500 square foot roof and stored in a 5,000 litre cistern satisfies all the toilet flushing and laundry needs (50% of indoor use), plus an extra 248 litres per day for outdoor use 4 months of the year, for every home.

   iii. For each of 500 homes in the single-family development section of the Compact Community, rainwater harvested from a 1,500 square foot roof and stored in a 5,000 litre cistern satisfies all the laundry needs (50% of indoor use), plus an extra 363 litres per day for outdoor use 4 months of the year. There is no rainwater harvesting in the townhouse or apartment sections of this community.

   Rainwater harvesting can support a large portion of an indoor water use budget and a portion of summer outdoor water use needs.

c. ***Wastewater Recycling.*** The water saving potential of wastewater recycling was assessed for the Compact Development model only.

i. Large Lot Rural could take advantage of greywater reuse for toilet flushing and wastewater recycling for subsurface irrigation.

ii. Rural by Design could take advantage of greywater reuse for toilet flushing and wastewater recycling for subsurface irrigation.

iii. For all homes in the Compact Community, recycled wastewater is a source for toilet flushing and outdoor subsurface irrigation.

Wastewater recycling and greywater reuse both have the potential to offer an appreciable savings in the water use budget of a single-family home or a compact community.

These models are based on development in the Electoral Areas of the RDN outside water and sewer supply areas. We haven't compared compact community to development costs within existing municipal services. Servicing in these circumstances would be covered in part by Development Cost Charges.

6.0 Workshop on Sustainable Water Use

6.1 Context

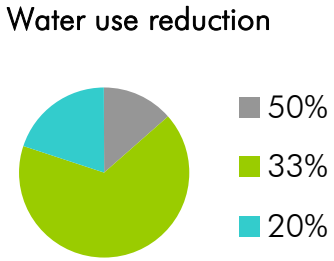
A workshop was organized to discuss the potential water saving applications and policy enablers. The attendees included: real estate agents, civil engineers, water utility managers, developers, planners, wastewater management consultants, politicians and representatives from local stewardship groups. There was representation from all the municipalities in the RDN.

Background presentations included:

- the context of water use in the region including summer shortages, population growth and the potential impacts of climate change,
- an explanation of the proposed sustainable water use strategies including potential water saving applications and policy enablers, and
- an exploration of the three illustrative models to analyze water use in a land use development context.

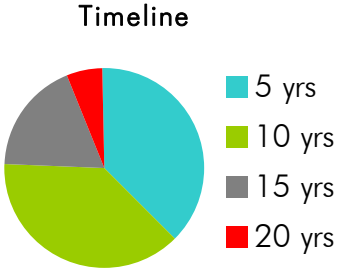
After the presentations a facilitated discussion explored some of the topics presented and the questions posed in the response form included as Appendix D. Sixteen out of thirty attendees completed the response form. The responses received as well as notes from the discussion are summarized below.

6.2 Responses



Question 1. Percent water use reduction.

The majority of respondents chose a 33% reduction in water use an indication of support for this studies' strategic goal of steady state water use as population increases. The second most favoured reduction target is 20%. Two respondents chose a 50% reduction which would shift the average daily use rate from 366 litres per day per person to 184 and place RDN use rates in between average use in France (150) and Sweden (200).

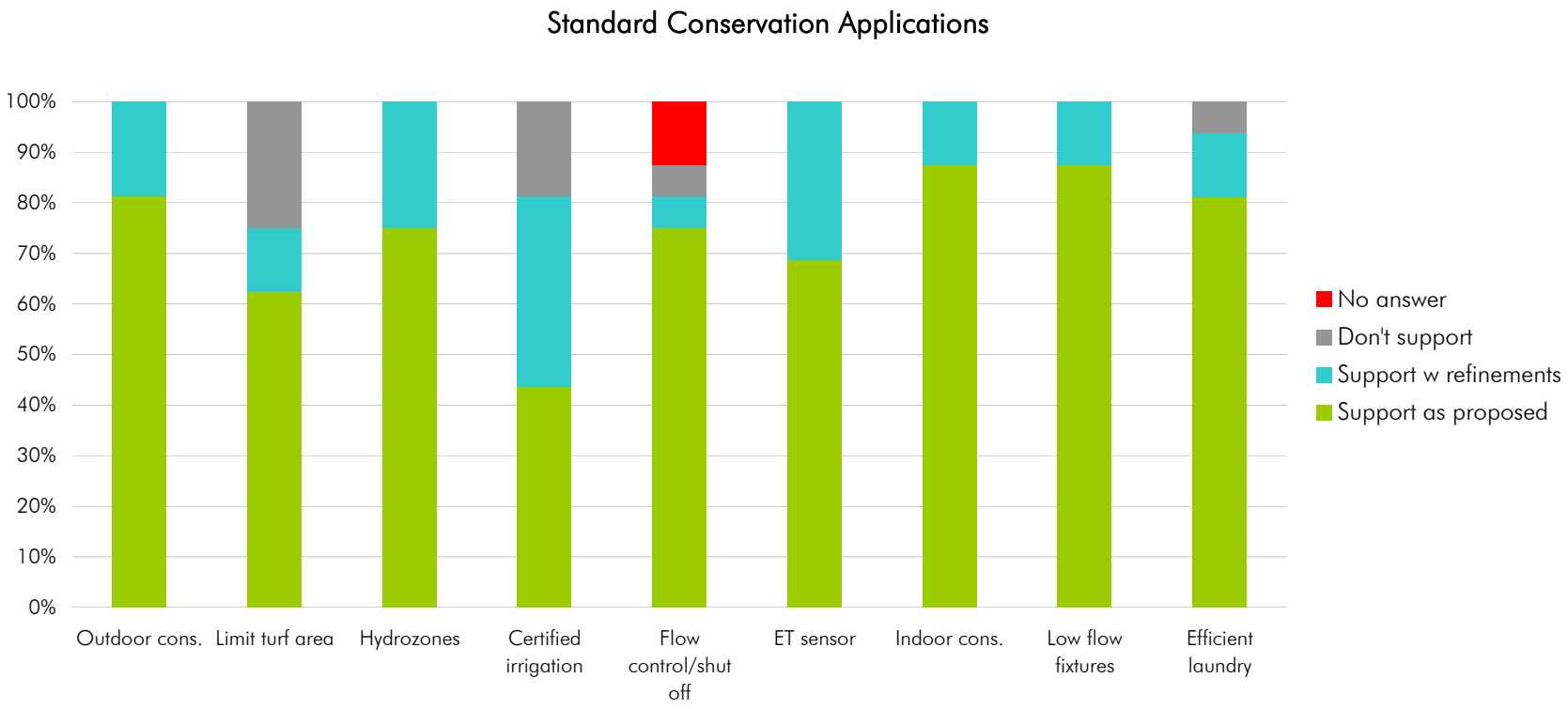


Question 2. Timeline to achieve reduction.

The majority of respondents believe a strategy can be achieved in 10 years. Only 3 of the 10 respondents in favour of a 33% reduction goal thought the strategy would take longer than 10 years.

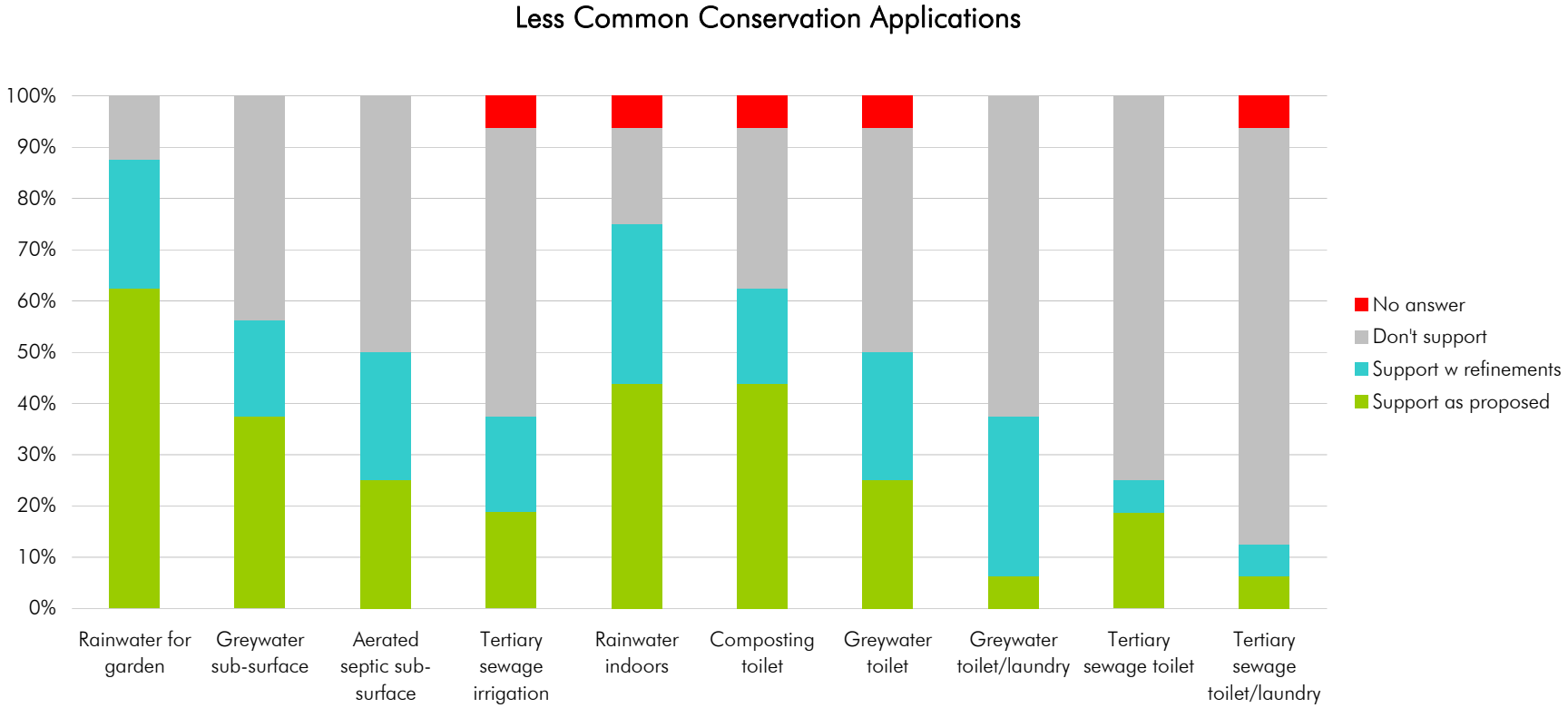
Question 3. Support for standard conservation applications. See list on table.

The main comments related to non-support or support with refinements are: technically demanding application (certified irrigation, flow control) or too much regulation (limit turf area).



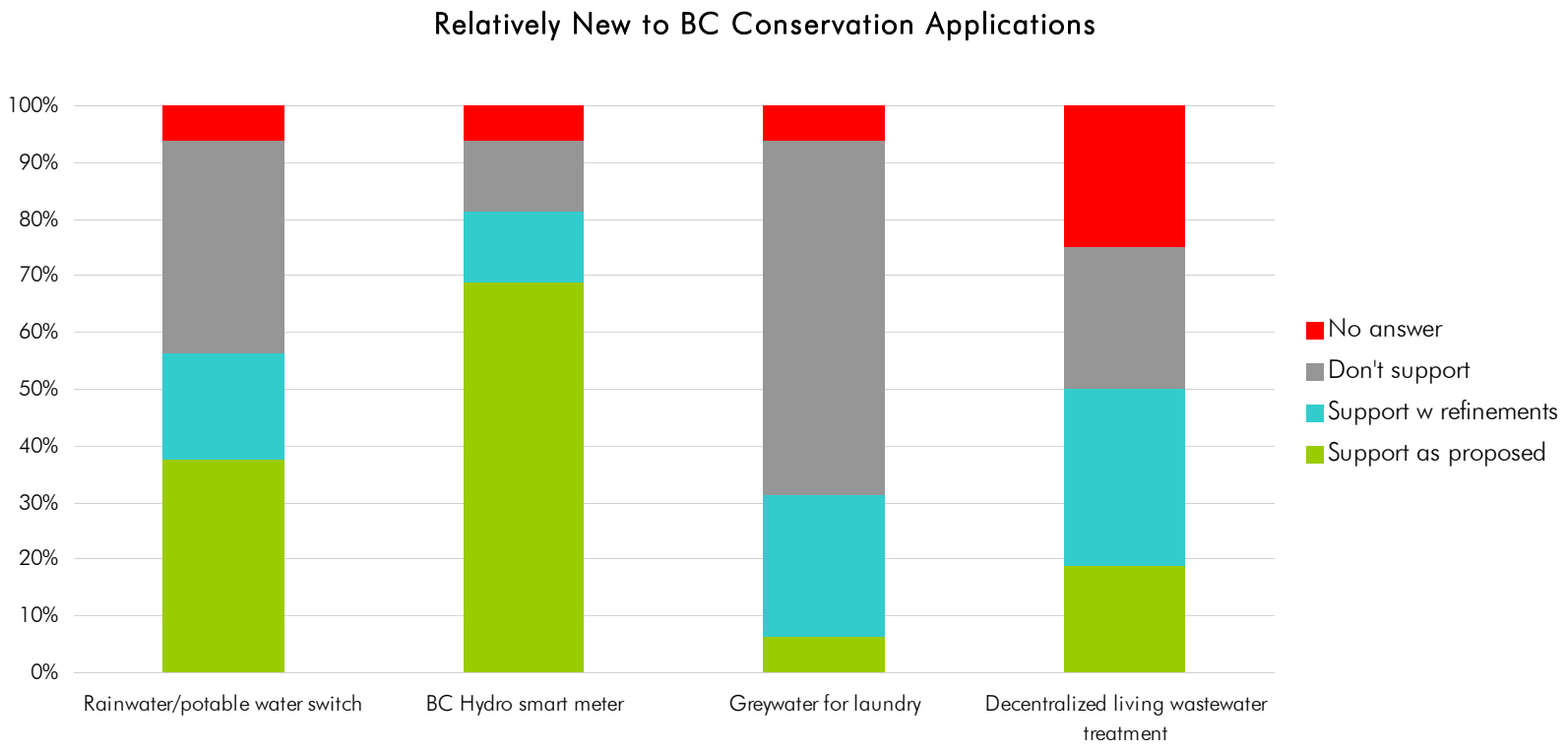
Question 4. Support for less common water conservation applications. See list on table.

Comments related to rainwater applications include: cross-connection issues, maintenance. Comments directed at greywater and wastewater applications include: no need, we're not in a desert, need monitoring and maintenance regime, more suited to community system.



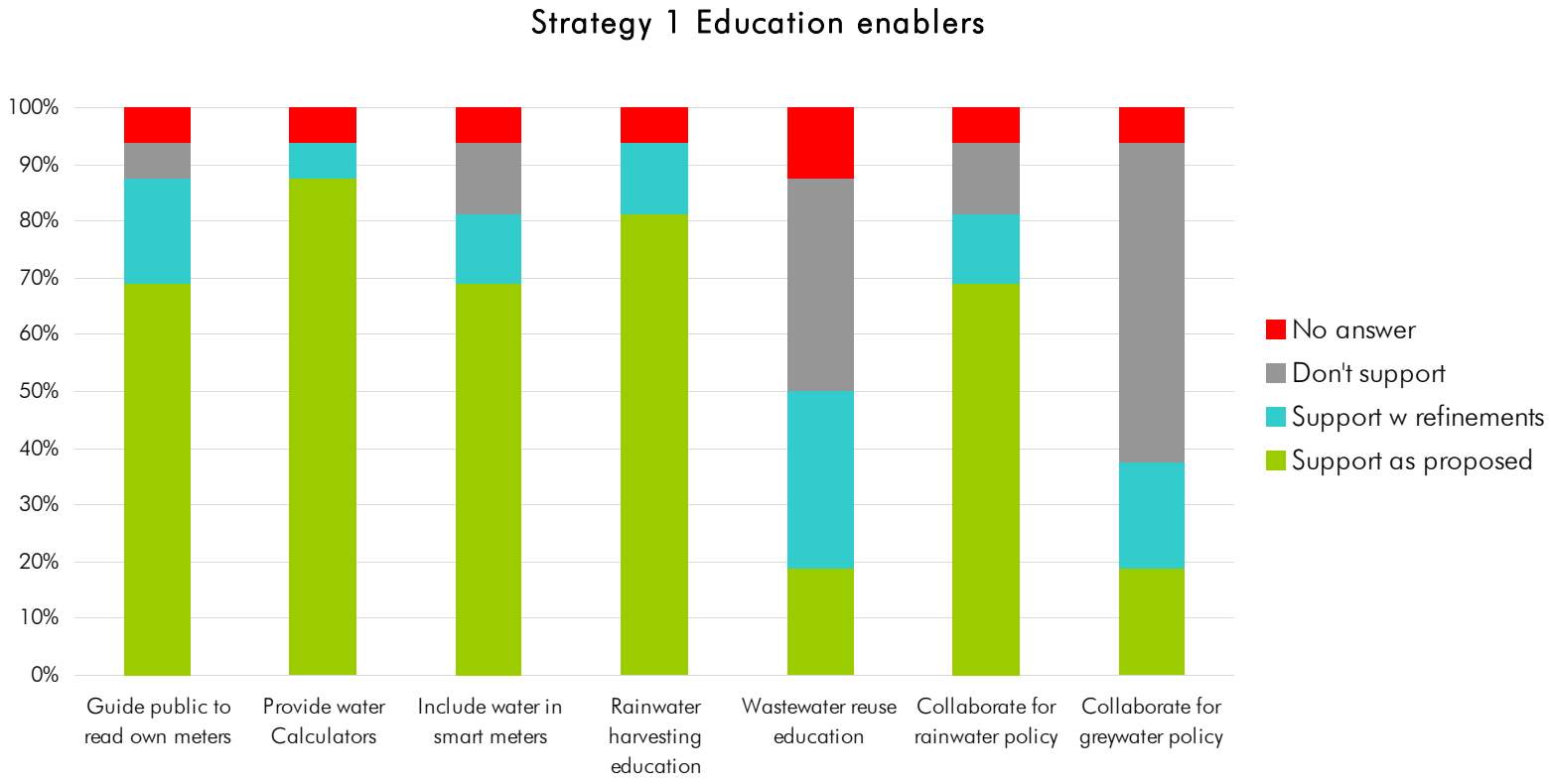
Question 5. New to BC conservation applications. See list in table.

Comments for rainwater switch include cross-connection concerns. Treated greywater is either not supported for laundry or only supported with rigorous controls and monitoring.



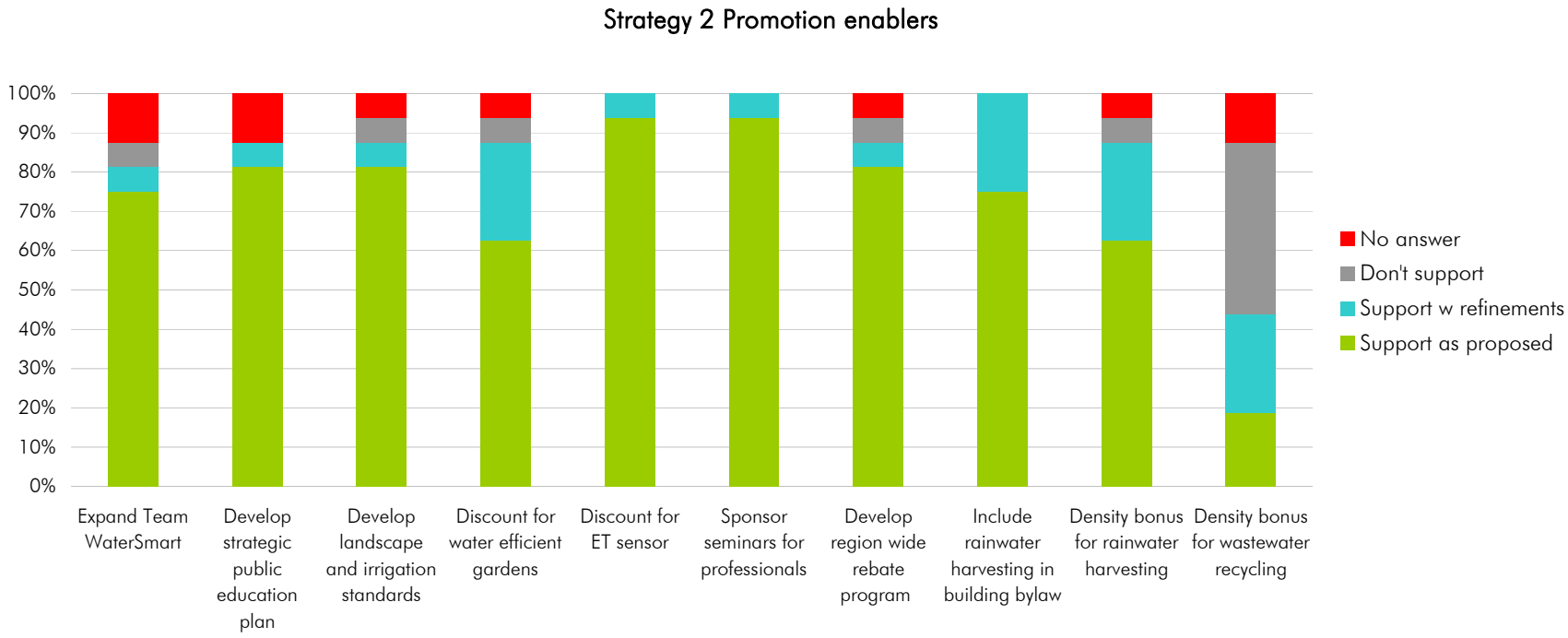
Question 6. Strategy #1 Education enablers. See list in table.

Comments for rainwater include educate as soon as possible. One comment stated that it's premature to develop a greywater policy in a rainforest.



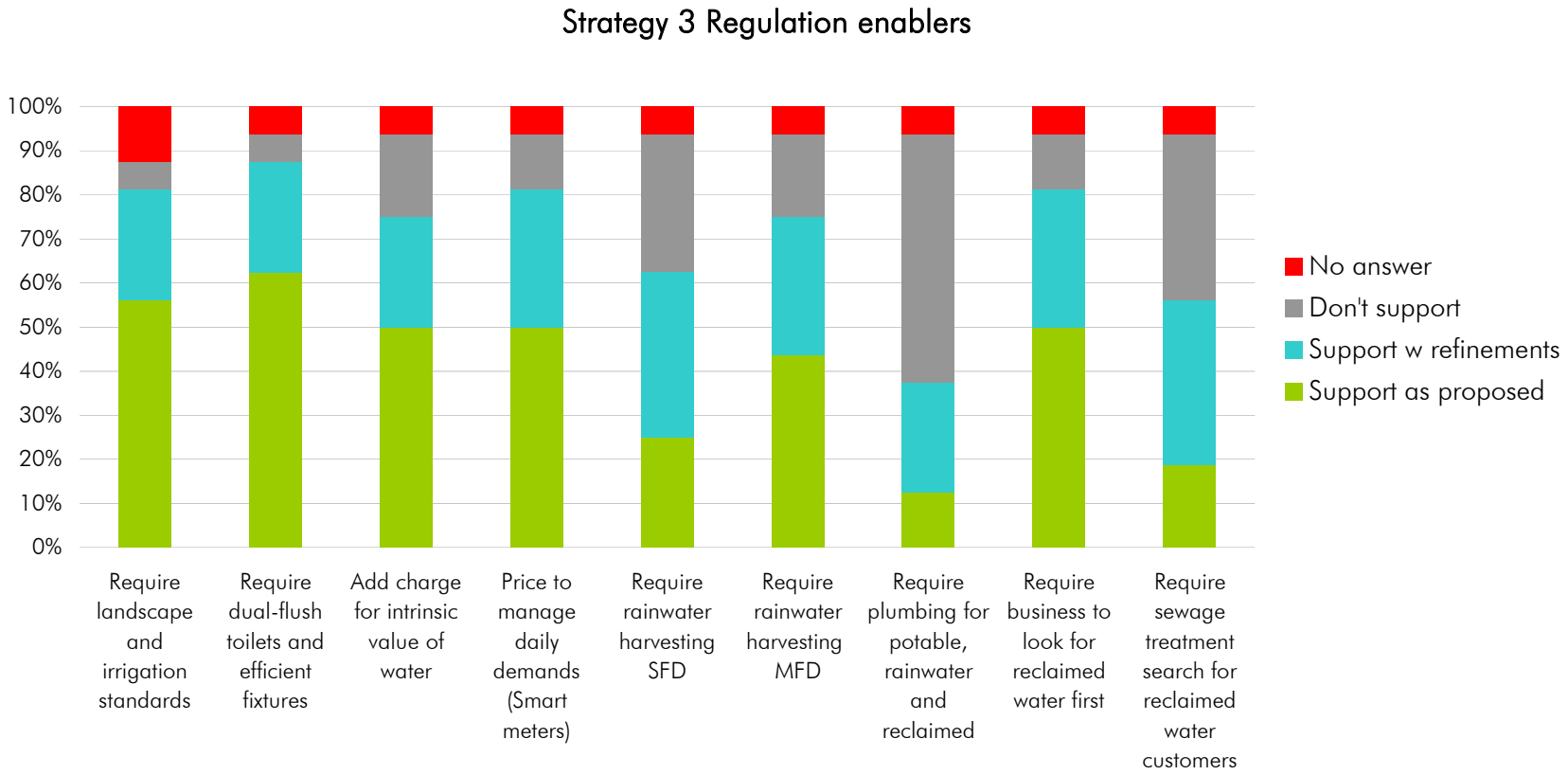
Strategy #2 Promotion enablers. See list in table.

Comments for wastewater reuse are similar as previous. There is a request to know the specifics of each individual project and a qualification that more time is needed to investigate and research the potentials for wastewater reuse.



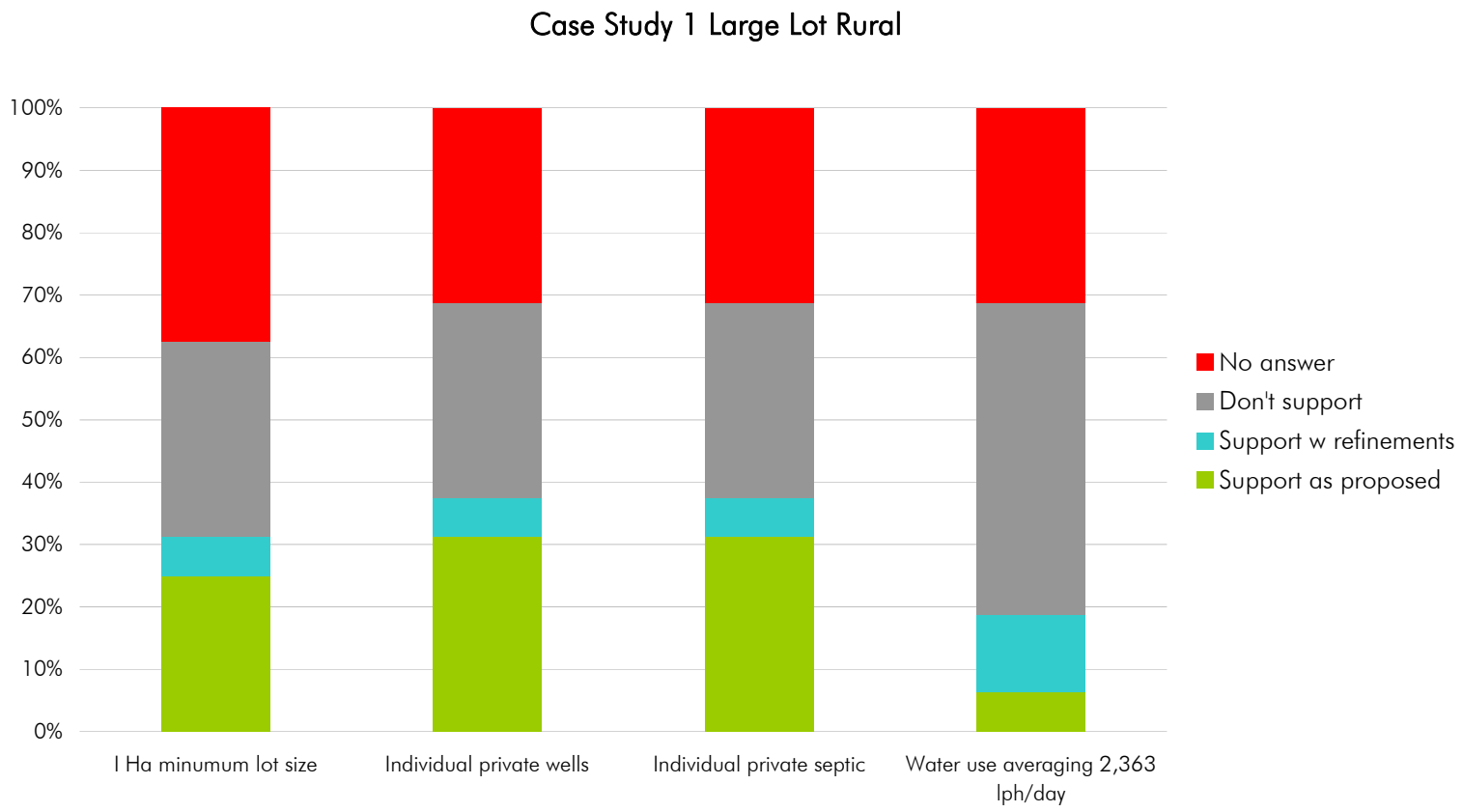
Strategy #3 Regulation enablers. See list in table.

Comments for rainwater requirements ask for a focus on incentives and an emphasis on stormwater management. Comments for reclaimed water plumbing and reclaimed water customers include: health risks, not necessary, for specific commercial and industrial applications only.



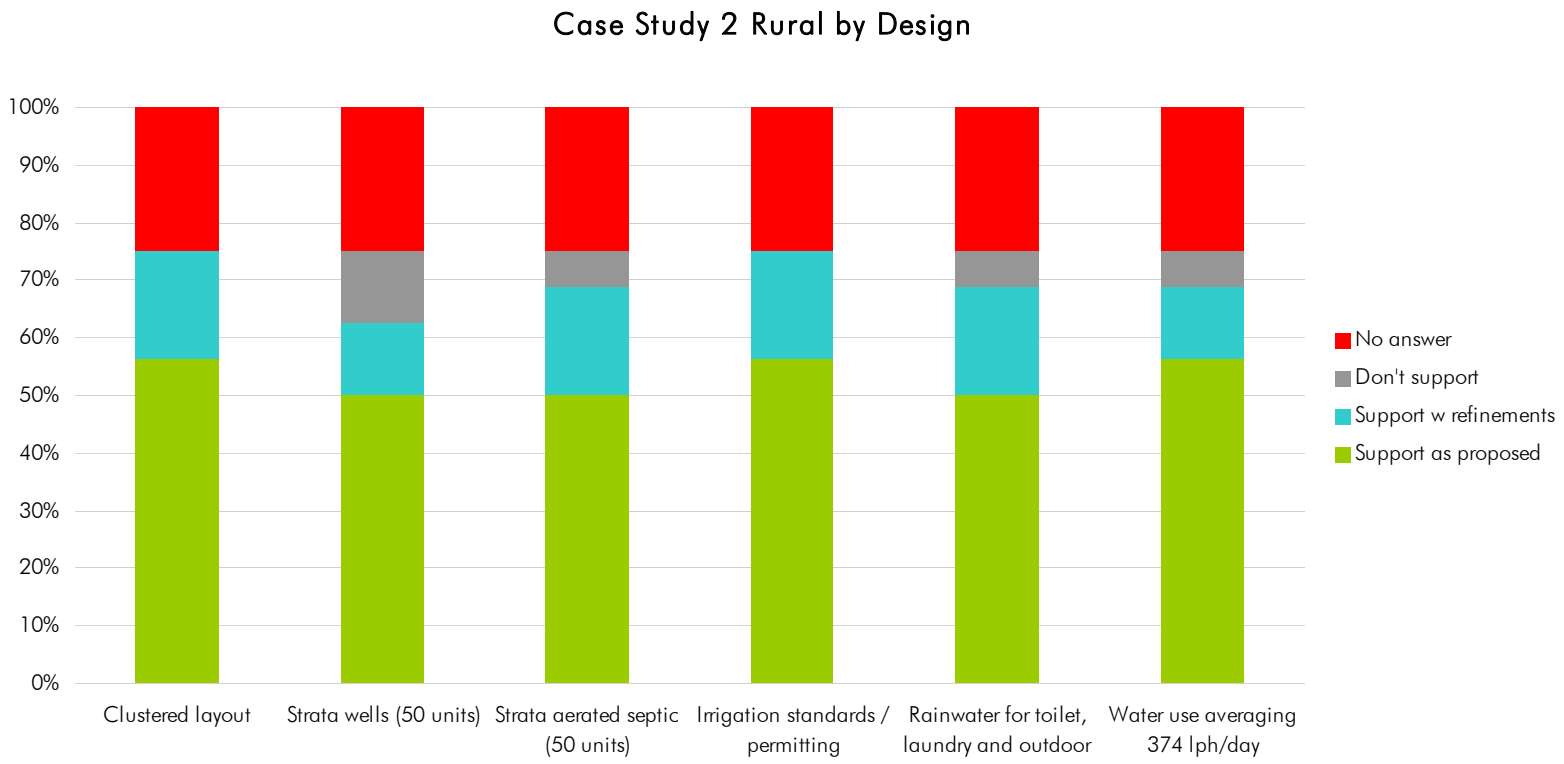
Case Study #1 Large Lot Rural. See list in table.

Comments include: not fair representation of water use, can irrigate less, problem with failed septics, no monitoring, this is island life.



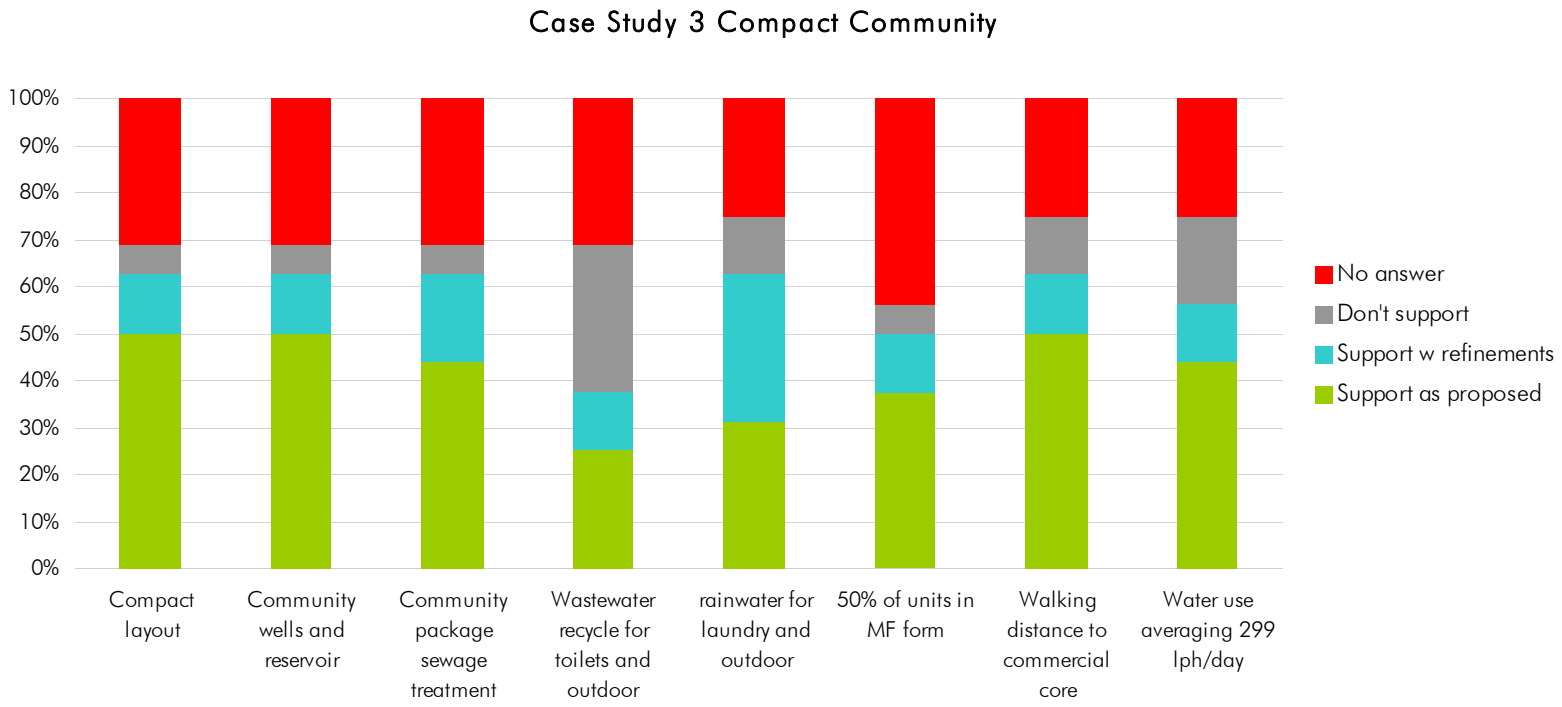
Case Study #2 Rural By Design. See list in table.

Comments include: all land uses have a place in the RDN, strata management can be problematic, alternatives to lawns should be examined.



Case Study #3 Compact Community. See list in table.

Comments include: urban style should be limited to urban areas, too extreme for the rain forest, good solution if can manage properly.



6.3 Summary

A majority of responses indicate support for a 33% reduction in water use within a timeline of 10 years, general support for most conservation applications except for greywater and wastewater applications. The reuse of wastewater was more acceptable at the community scale or for multi-family dwellings with assured management, monitoring and maintenance.

Most of the policy enablers were supported with less support for wastewater reuse. The majority preferred an implementation approach with emphasis on education and incentives as opposed to regulation.

Two hierarchies of preference evolved from the day:

- Water saving applications: Top of the list was efficiency techniques, then rainwater harvesting and then wastewater reuse.
- Water saving enablers: Top of the list was education, followed by incentives and then regulation.

A few points of the discussion not represented in the response forms are:

- Pricing has a large impact on water use and should be explored as a prime motivator.
- Considerable water savings are achievable by fixing leaks and managing pressure in system and household lines 10-30%.
- Available water supply and the effects of climate change are uncertain, better to take the precautionary approach and practice water conservation.
- Manifesting compact development is challenging, the RDN lacks the legislative power that municipalities do and water/wastewater infrastructure is expensive.
- New renewable energy financing models could be a system to follow; in these models the bank loans money to strata council for the capital cost and then receives payments to the loan based on the savings difference between traditional energy costs and new efficient energy costs.

7.0 Principles and Recommendations

7.1 Principles

The following principles are recommended towards implementing water sustainability measures in the Regional District of Nanaimo:

1. When possible, investigate and decide upon a long-range future water use target based on the ecological limit of available water.
2. Plan policies to manage water use within this ecological limit. In the meantime pursue water conservation as a precaution to eventual water constraints.
3. Use a phased approach to implementation to allow consumer and industry adaptation.
4. Blend new requirements with existing policies, bylaws and procedures as far as possible, rather than inventing new ones.
5. Use standardization where it leads to effectiveness and efficiencies, while also encouraging innovation to meet stated performance targets.
6. Encourage use of state of the art design, construction and operating techniques for water conservation, and make these techniques affordable and commonplace.
7. Recognize that smaller, low cost single family building projects may not be able to support the involvement of professional consultants or professional management/maintenance of systems.
8. Provide for continuous improvement of water conservation as a part of a broader sustainability strategy.
9. Monitor progress towards reaching water conservation targets, and adjust the actions as required to increase public acceptance and effectiveness.

The suggested strategy has short term (next two years) and middle step (next two to four years) components as well as a long-term vision into the future.

7.2 Short Term Implementation Recommendations

A comprehensive list of actions that can enable the proposed sustainable water use strategy over the long-term are listed in Section 7.4 organized by technique and time frame. An overview implementation plan, 'Table E-1: Implementation Action Plan', is presented in condensed table format below. Select short-term recommendations are discussed more fully in Section 7.3. These short-term recommendations are designed to offer options to immediately address peak summer water use in the RDN water service areas.

Table E-1: Implementation Action Plan

Phase/Project #	Action	Action Leader	Action Partners
1A	**Increase education – set the stage.**		
1A1	Distribute landscape guide to water efficiency brochure.	District staff	Stakeholders
1A2	Facilitate voluntary meter reading, enhance water bill format, post water use calculators and alternative water source examples on website.	Consultant	District staff
1A3	Increase door-to-door campaign. Quantify and monitor results.	Team Water Smart	District staff
1A4	Offer water audits. Quantify and monitor results.	Consultant	Team Water Smart
1A5	Include water purveyors, irrigation specialists, engineers, developers, realtors and others in outreach campaigns. Establish a quarterly working committee with RDN staff to strategize innovative methods for water centric development.	District staff	Stakeholders
1A6	Consult with the Vancouver Island Watershed Steering Committee.	District staff	Stakeholders
1B	**Develop landscape and irrigation design standards, specs, draft bylaws**		
1B1	Create draft landscape and irrigation design standards/ specs.	Consultant	IIABC, BCSLA, BCNTA
1B2	Create bylaw updates (Subdivision, Building, Water bylaws) for ICI and Multifamily	Consultant	District staff
1B3	Perform legal and Council review, stakeholder review	District staff	Stakeholders
1B4	Support Board adoption of standards / bylaw revisions.	District staff	Consultant
1B5	Create forms / checklists for plan checkers and designers.	District staff	Consultant, IIABC, BCSLA, BCNTA

Phase/Project #	Action	Action Leader	Action Partners
1B6	Organize review and approval process.	District staff	Consultant
2A	**Adjust water use bylaw (first step)**		
2A1	Introduce summer conservation surcharge to emphasize the higher value of summer water.	District staff	Consultant
2A5	Require a permit for irrigation and/or charge a water use impact fee.	District staff	Consultant
2B	**Develop strategic plan**		
2B1	Hire Water Efficiency Coordinator.	District staff	
2B2	Develop water conservation plan as described in the Drinking Water-Watershed Protection Report.	Consultant	District staff
3A	**Create incentive programs**		
3A1	Develop a turf replacement program.	Consultant	District staff
3A2	Pay partial amount towards the removal or renovation of an inefficient irrigation system.	District staff	Consultant, IIABC
3A3	Offer a one-time discount in water rates for water efficient landscape and irrigation design – new and retrofits.	District staff	IIABC, BCSLA, BCNTA
3A4	Offer rebates/discounts for dual-flush or composting toilets and efficient fixtures.	District staff	Local Contractors
3B	**Pilot ICI and Multifamily projects**		
3B1	Showcase landscape and irrigation standards.	District staff, IIABC, BCSLA, BCNTA	Development Community
3B2	Showcase innovative rainwater harvesting system for irrigation and/or indoor use.	District staff	Development Community
3B3	Collaborate with business and development community to pilot a water-recycling project. This could be water recycling within a commercial or industrial operation or reuse of water from RDN sewage plant upgrades.	District staff	Business, Development Community
3B4	Prepare summary report on pilot projects. Continue to monitor and report.	Consultant	District staff
3C	**Enable proper use of alternative water sources**		

Phase/Project #	Action	Action Leader	Action Partners
3C1	Include rainwater harvesting guidelines and standards for indoor and outdoor use.	Consultant	District staff, VIHA, MoE
3C2	Include greywater and wastewater reuse guidelines and standards, for installation of shower and bath to toilet indoor system and subsurface outdoor irrigation system.	Consultant	District staff, VIHA, MoE
4A	**Adjust water use bylaw (second step) Water Smart Program**		
4A1	Create Water Smart Certification criteria and develop an application form and audit process.	Consultant	District staff
4A2	Develop a Water Smart Household public involvement campaign.	Team Water Smart	Consultant
4A3	In the Water Use Bylaw, allow eased watering restrictions Water Smart Certification.	District staff	Consultant
4A4	Offer contest to attract a few pilot households for Water Smart Certification.	Team Water Smart	District staff
4B	**Regulation adoption - Building Bylaw and zoning updates**		
4B1	Integrate landscape and irrigation standards as a requirement for single-family developments. These standards are already required for ICI and Multifamily. Require a weather-based ET Sensor for all irrigation installations.	District staff	Consultant
4B2	For new comprehensive multi-home developments, require a collective water harvesting system for irrigation purposes – i.e., install line feeds from roof leaders to a central rainwater reservoir or detention vault.	District staff	Consultant
4B3	Offer incentives for larger developments that demonstrate a water efficient development including either rainwater harvesting and/or greywater wastewater reuse.	District staff	Consultant
5A	**Integrated Comprehensive Water Management**		
5A1	Create an action plan for the second five years of the program.		
5A2	Assess the impact all new development will have on water systems. Require minimal impact.	District staff	
5A3	Collaborate strategic planning for water supply, stormwater management and wastewater management. Capitalize on rainwater harvesting benefit for stormwater attenuation.	District staff	
5A4	Promote a Water Retrofit contest. Create incentives for housing stock to be water	Team Water Smart	District staff

Phase/Project #	Action	Action Leader	Action Partners
	efficient.		
5A5	Check in routinely with the public and businesses via surveys, focus groups, etc. to see what information and programs they need to achieve water efficient behaviour.	Team Water Smart	District staff
5A6	Add a component of price to convey the value of water in itself, beyond just the cost of distribution.	District staff	Consultant

7.3 Short Term Implementation Recommendations Discussed

7.3.1 Pricing, Metering and Billing

Appropriate pricing, metering and billing regimes can be persuasive enablers that promote water efficiency. As revealed in the table of daily rates and monthly totals below, the RDN has comparable water rates with other local regional district operations. It is important to note that sewage rates follow a similar trend to water rates. Any water use reduction would lessen the water and sewer bills.

The table on the next page contains a variety of water pricing methods summarized and converted from a variety of water volume measures in order to represent a set of numbers that can be compared. This table only compares water rates and does not include any other costs that a homeowner might pay in combination with property tax. There can be a number of variables that drive the establishment of water rates by Regional Districts. These can include: number of connections, number of taxable folios, debt payments and method of recovery, contributions to capital reserve funds, contingency funds and capital works funded on a one-time basis from operating funds.

Irvine Ranch, California			Southern Nevada Water Authority			City of Kelowna (for a 3/4" meter size)			Boulder, Colorado			City of Nanaimo		
Use based on percentage of Allotment	Rate per percentage of allotment	Cost	Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per percentage of allotment	Cost	Use based on percentage of Allotment	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per cubic metre per day	Cost
0-40%	$0.82	$3.51	<0.63	$0.29	$5.50	Base	$7.84/month	$7.84	0 - 60%	$0.50	$9.02	Base	$0.35/day	$10.56
41-100%	$0.98	$6.29	0.64-1.26	$0.50	$9.45	<1.0	$0.23	$6.90	60 -100%	$0.66	$8.00	<0.6592	$0.16	$3.18
101-150%	$1.96	$5.07	1.27-2.50	$0.69		1.1-2.67	$0.30	$2.39	101-150%	$1.32	$10.00	>0.6592	$0.75	$14.80
151-200%	$3.92		>2.51	$0.92		2.67-4.17	$0.46		151 - 200%	$1.98				
>201%						>4.17	$0.92		>201%	$3.31				
		$14.87			$14.95			$17.13			$27.02			$28.54

Region of Durham, Ontario			CRD Fernwood and Highlands Water Service Areas			Sunshine Coast Regional District			Nanaimo Regional District			CRD Beddis Water Service Area			Eaglecliff, Bowen Island		
Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per cubic metre per day	Cost	Cubic metres per day	Rate per day	Cost
Base	$9.42/month	$9.42	<0.67	$0.50	$10.00	Base	$16.91/month	$16.91	Base	$0.25/day	$7.50	<0.758	$1.58	$35.90	<0.22	$0.79	
<1.5	$0.86	$21.20	0.68-1.11	$1.00	$13.33		0.420244534	$15.91	<0.7	$0.86	$21.00	0.759-1.513	$2.10	$31.52	0.221-0.455	$0.82	
1.51-150	$1.00		1.12-1.56	$2.00	$9.03				0.71-1.4	$1.00	$16.40	1.514-3.788	$3.16		0.456-0.682	$0.89	
>150	$1.25		>1.56	$4.00					1.41-2.1	$1.25		>3.788	$5.26		0.683-0.796	$0.99	
									2.11-2.8	$1.50					0.797-0.909	$1.10	
									2.81-3.5	$2.00					0.910-1.023	$1.21	$36.16
									>3.51	$3.00					>1.023	1.50 per cu.m.	$41.34
		$30.62			$32.36			$32.82			$44.90			$67.42			$77.50

Comparison of pricing for 37.83 cubic metres (10,000 US Gallons) consumed in one month. For Irvine Ranch and Boulder, Colorado the allocation amount is 30.28 cubic metres (8,000 US Gallons).

Please note that the top row of pricing regimes, City of Kelowna, Boulder Colorado and City of Nanaimo, represent lower rates because City water systems are often subsidized. Regional districts in BC, such as the RDN are not permitted to subsidize water operations.

The Regional District of Nanaimo has already implemented three steps of a pricing regime geared towards efficient water use:

1. All customers in the RDN Water Service Areas are metered.
2. The fee schedule is based on inclined block rates. As a customer uses more water, the price of the water increases to encourage conservation.
3. There is a base allocation of water offered at a discounted rate. The approximate cost to pump, treat, test, distribute and maintain the system is $1.15 per cubic metre. Each

customer is charged a discounted rate 0f $0.86 per cubic metre for water usage up to 0.7 cubic metres per day. From 0.7 to 1.4 cubic metres per day a customer is still charged less than the real cost. Past that usage rate the costs increase. As water use reductions progress, the RDN may need to adjust its rates and perhaps lower the volume that is eligible for a discounted rate in order to ensure adequate funding is generated to operate the system.

The RDN inclined block-pricing regime was recently modified and although extensive alterations are not advised immediately, there are some enhancements that could further promote efficient use.

Immediate opportunities:

1. Introduce a summer conservation surcharge. The highest water use occurs in the summer when there is the least amount of water available. Adding a surcharge of $0.10 per cubic metre for outdoor water use would motivate more efficient outdoor water use practices. The amount of outdoor water use is easily obtainable by subtracting the winter use amounts from the summer use amounts. On average this surcharge would cost a water service customer approximately $10.00 per year. The fact that higher water users would pay more achieves the intent to motivate these higher users to curb their water use.

   The money generated from the summer conservation surcharge (approx. $20,000 for the water service areas) could fund water conservation initiatives. As summer outdoor use practices become more efficient the revenue from the surcharge will diminish and conveniently, so will the need for conservation initiatives.
   If all the municipalities within the Regional District of Nanaimo also adopted a summer water use surcharge, the potential total amount of funds available for a coordinated conservation program would be in the neighbourhood of $370,000.

2. Support monthly meter readings in the summer. The intent behind monthly meter readings is to tie usage patterns closer to weather patterns and irrigation needs.
   In the region, irrigation demands respond to the variations in summer climate. They rise in May and June, peak in July and taper off in August and September. A monthly meter reading signifying these differences would help water customers adjust their usage appropriately.

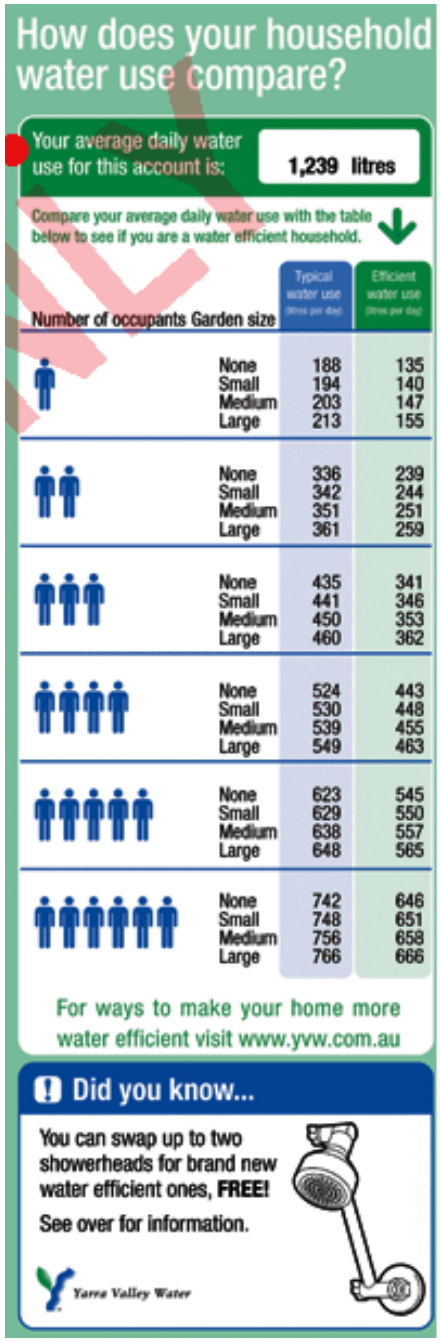
Lawns are the largest water drain during summer months.

Staff could read water meters, or if staff time costs are an issue, water service area customers could read their own meters on a voluntary basis. To support volunteers, an insert containing instructions on how to read a water meter could be included in the spring water bill. The same instructions could be presented on the WaterSmart website. If staff read the meters, the results could be available to customers via mail, email or through the Internet via a password protected entry point. The ability to view account history and usage summaries is a common practice with utility providers. The most important point would be to offer water use calculators and other information tools on the website that could help customers evaluate and adjust their water use behaviour in response to their use pattern.

A change in the billing cycle to reflect monthly usage patterns will not change the cost of water significantly. An inclined block rate is charged based on daily use patterns. Consider a comparison of costs based on average use amounts over the summer of 1000 litres for outdoor use and 500 litres for indoor use. If this use pattern is averaged over the entire summer (25% of total water used in each month) or if it is distributed based on irrigation needs (22% from May 15 – June 15, 26% from June 15 – July 15, 35% from July 15 – August 15 and 24% from August 15 – September 15) the total amount of the bill varies by $0.50. Following the same use pattern for comparison with an outdoor use volume of 2000 litres the total amount of the bill would vary by $1.25.

The key point is that less water should be used in the shoulder months than in the middle of summer. There will be a radio-reading test in select areas in the summer of 2008. Perhaps this method will be efficient and easy to implement on a larger scale. However they occur, monthly meter reading would be a visual reminder to help people use the appropriate amount of water to match the weather needs each month. Reminders and prompts detailing appropriate amounts of irrigation water for the following month could accompany the meter reading.

3. Enhance water bill format. Providing usage and conservation information at the time a customer is faced with paying for water is an opportune time to build awareness. Currently the water bills are included with other RDN fees such as garbage and recycling. The billing software allows for a few lines of text along with the unit charge. The RDN could consider distributing a graphically engaging water bill as part of a



water use awareness campaign. This approach would require using a new form of software to generate bills and is recommended. Working with the present billing system, it's fairly easy to include a standard format insert with the bi-annual bills. The two lines of text on the standard bill can provide customer specific information such as amount of previous winter and summer usage or costs per inclined block rate and then refer to the insert for more general water usage information.

Information to include in the insert:

1. Graph showing previous and current use patterns for each water service area.
2. Comparison with typical (median) rates for households in the RDN water service areas and other regions with similar climates and lower usage patterns such as England and France. A table would list a variety of use rates based on the number of residents and size of garden.
3. Use rates for households with different number of residents and garden sizes that use best practices in water saving techniques.
4. Include colours and information grouped in boxes to captivate the reader and effectively communicate information. See Yarra Valley Water bill in chapter 2.0 of this report for an example.
5. Include water saving tips appropriate to the time of year.
6. Include a trend of water use over the past few years either in comparison to weather patterns or adjusted to remove the weather induced water use differences.

The graphic composition of the bill will entice the reader. The comparative information has potential to motivate the customer to change behaviour and the water saving tips offer options of how to change behaviour in the current seasonal context. The inclusion of a trend in water use graph will show customers progress in water savings and provide motivation towards a goal.

4. **Offer retrofit rebates or discount on fees for indoor efficiencies.** Large water and wastewater savings are easily attained through toilet and fixture retrofits. The RDN already requires 6 litre low-flush toilets in new construction. Current provincial regulations limit the ability to require dual-flush toilets and/or low flow showerheads and sink aerators. There are still many existing homes that use older high volume toilets. Here are two potential options the RDN has to support bathroom retrofits:

Dual flush toilets offer immediate savings with no extra work or maintenance other than installation – easy water conservation.

1. Search for funding sources such as the Liquid Waste Management Department, a summer water conservation surcharge or federal gas tax money. Susan DeGryp CRD Director for the Southern Gulf Islands and Mary Cooper from the Mayne Island Integrated Water Systems Society are currently working on an application package to use federal gas tax money for a dual flush toilet rebate program. They have the support of many senior political offices at the provincial and federal levels. At issue is the fact that funding is designed to support locally owned infrastructure and toilets are technically not owned by the local government. The application could stress the fact that retrofitting toilets and fixtures lessens the need for investment in water and wastewater infrastructure and a similar application from the RDN could help convince the fund managers to support such projects.
2. Reward bathroom retrofits including the installation of composting toilets with a one-time discount on water fees.

7.3.2 Landscape and Irrigation Design and Water Restrictions

Planning an outdoor space with appropriate design offers the greatest chance of water conservation.

Supporting different landscape and irrigation designs can provide an immediate reduction in peak summer water demand. An in depth strategy to lessen summer water use by 16% within the City of Kelowna is currently being developed. This strategy explores similar approaches specific to landscape and irrigation design.

Immediate opportunities:

1. Develop landscape and irrigation design standards that are required for all Multifamily, Commercial, Institutional and Industrial development. The table below lists the actions needed to ensure a water efficient landscape along with the entity that would need to specify, design, apply or inspect the application. These standards can be referred to as a guide for single-family homes and potentially required at a later date.

Strategy	Action	Target for Change
Planting Guidelines for Water Sustainability	a. Minimize turf areas and include plants with low water needs.	Planting designer / homeowner
	b. Plant appropriate grass species.	Seed / sod suppliers
	c. Replace turf with plants.	Planting designer / homeowner
	d. Use mulch.	Specifier / installer / homeowner
Soil Guidelines for Water Sustainability	a. Provide adequate soil depth.	Specifier / installer / homeowner
	b. Get soil tested.	Specifier / installer / homeowner
	c. Aerate soils.	Maintainer / homeowner
	d. Supplement soil with organics	Specifier / installer / homeowner
Irrigation Guidelines for Water Sustainability	a. Require certified irrigation association members to design all irrigation systems.	Irrigation designer / City
	b. Provide approved product list.	Irrigation designer / City
	c. Design irrigation systems, and program watering schedules, based on the water needs of different plant types and site conditions.	Irrigation designer (co-ordinated with planting designer)
	d. Design drip irrigation systems where appropriate.	Irrigation designer
	e. Install pressure-regulating devices in high-pressure situations.	Irrigation designer
	f. Address elevation changes.	Irrigation designer
	g. Match precipitation rates of all sprinklers on a single zone.	Irrigation designer
	h. Match precipitation rates, patterns, and spacing of rotors on a single zone.	Irrigation designer
	i. Install automatic shut-off device(s) on every system.	Irrigation designer
	j. Install automatic controllers with water conservation functions.	Irrigation designer
	k. Program automatic controllers for seasonal/daily/microclimate variability.	Irrigation designer/maintainer
	l. Program irrigation for multiple start times on a given zone.	Irrigation designer/maintainer
	m. Align heads during construction to avoid over spray onto adjacent structures, paving and properties.	Irrigation installer
	n. Undertake comprehensive scheduling.	Irrigation maintainer/homeowner
	o. Provide on-going maintenance.	Irrigation maintainer/homeowner
	p. Require annual inspections on all water meters, backflow preventers, pressure regulators and booster pumps.	Irrigation maintainer/homeowner / City
	q. Trim turf and clean up around sprinkler / rotor head on a regular basis.	Irrigation maintainer/homeowner

Unnecessary water waste can occur when irrigation systems are designed, installed, scheduled or maintained improperly.

2. Develop a turf replacement program. Lawns demand more water than any other landscaping choice. Any initiative to reduce lawn area or switch to a drought tolerant form of turf can reduce outdoor water use. Examples are the Southern Nevada Water Authority turf replacement program ($2 per square foot to remove turf) and the City of Kelowna's Drought Tolerant Eco-Lawn Cost-Sharing Incentive (the city pays for the shipping of drought tolerant grass seed).

3. Require a permit for irrigation. The water audits during the summer of 2007 revealed that all of the irrigation systems inspected were designed, installed and maintained improperly. Although some steps could be taken to remedy inefficiencies, in all cases, the systems were not designed nor installed to run at optimum performance. In most cases, in order to achieve proper water efficiencies, extensive and expensive renovations are required.

   Unless an irrigation system is properly designed, installed and maintained it is often more water efficient to use a traditional hose-end sprinkler system that is carried out onto the lawn only when needed. There can be a false sense that an irrigation system is efficient. But this is only the case when the irrigation system is properly designed, installed, programmed and maintained.

   It would be possible to develop in collaboration with the Irrigation Industry Association of BC (IIABC) a Water Smart certification process and to require that all irrigation systems must be either installed or reviewed by a Water Smart certified installer.

4. Charge a water use impact fee. In order to ensure that new irrigation systems are installed to proper standards, a fee schedule (fully refundable if certain criteria are met) could be charged at the building permit or irrigation permit stage. The permit fees are meant to level the playing field for costs associated with inefficient discount systems and systems with expensive components that use significantly less water. The main features of the fee structure are:

   1. Fees to be calculated based on lot area. For example: $2/square metre for an 800 square metre lot would generate a $1600 fee.
   2. An additional $400 would be a refundable administration fee. This would be waived if an independent "Water Wise Certification" is provided.
   3. Any retained fees would go to incentives or water infrastructure programs.

A weather based irrigation sensor offers the convenience of controlling the ideal amount of irrigation based on climatic conditions.

4. Credits applied would reduce fee to $0 by:
    a. $400 if 33% of lot is low or no water hydro zone.
    b. $200 for 150mm absorbent soils in lawn area.
    c. $200 for 300mm absorbent soils to shrub / groundcover & vegetables.
    d. $800 for no automatic irrigation system, or
    e. $500 for weather based irrigation controller, $200 for low volume spray rotors and drip (MP Rotator plus drip) and $100 for flow sensor and high flow shutoff.

5. **Lift water restrictions.** See Section 7.3.6 Recommendations for the Water Use Bylaw.
6. **Offer water audits.** The best way for a homeowner or strata complex to understand and improve their outdoor water use practice is with a personalized water audit followed by recommendations for system renovations. Audits could be offered free to high water use customers, by request with a small fee or as part of a door-to-door campaign depending on staff time.
7. **Pay partial amount towards the removal or renovation of an inefficient irrigation system.** Following a similar theory to the turf buy back program in Southern Nevada, there could be financial incentives offered to remedy or remove an inefficient irrigation system.

7.3.3 Public Awareness and Involvement

As the main techniques of a sustainable water use strategy that the RDN can act on are the enablers and these involve motivating the public, related professionals and developers, it's important to plan and implement a strategic public awareness and involvement campaign.

Immediate opportunities:

1. Utilize the benefits of Community Based Social Marketing (CBSM). There is growing recognition that the development of an integrated strategy to promote sustainable behaviour based on the principles of social marketing greatly increases the chances of long-term success. The principles below are derived and summarized from the work of Douglas McKenzie-Mohr Phd:
    1. Decide which sustainable behaviour(s) to focus on
    2. Identify the barriers and benefits associated with this behaviour through the help of surveys, questionnaires and focus groups
    3. Devise a program that focuses on tools for behavioural change: request commitment, remind with prompts, work with behavioural norms, use captivating and appropriate communication, provide incentives and remove barriers
    4. Quantify the successes, evaluate the program and use adaptive management to refine the goals and approach.
2. Hire a water efficiency coordinator. In order to move forward with a strategic plan and reach the next level in water efficiency there will need to be a central person to oversee Water Smart programs and initiatives as well as collaborate with RDN staff and other water related agencies and professionals. This position may be incorporated in the Drinking Water / Watershed Protection position, should that initiation proceed.
3. Include water professionals, developers, realtors and others in outreach campaigns. There are many venues to promote efficient water use. An assessment of how various professionals and regulatory agencies are involved with land use, and as a result water use, may reveal key opportunities to get the message out. One example is the Islands Trust Newcomer's Guide. This guide details information about the sensitive nature of the Gulf Island's ecosystems, visual landscape and water supply. Free copies are available to realtors so that any newcomer to the islands will be able to understand

During 2007 rain gages (of a different design) were distributed by the RDN. Because they were visible many residents requested them and used them to gauge irrigation needs. The benefits of visibility related to water conservation could be utilized with a sign signifying Water Smart Certification.

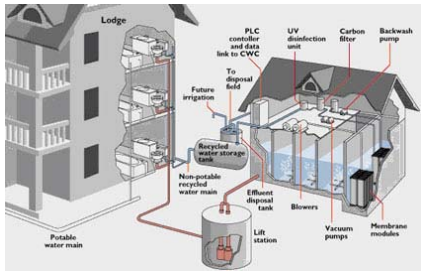
how to live in balance with the Gulf Island landscape before they arrive. This forethought can give new owners time to plan appropriate living practices. Sponsoring lunchtime seminars for irrigation professionals on water efficient practices is an example of another opportunity to inspire water efficient practices.

7.3.4 Planning

Compact development affords immediate savings in water use due to limited irrigable area.

1. **Establish a quarterly working committee with RDN staff, the province, developers and real estate agents.** The growth of compact communities as outlined in the Regional Growth Strategy is a challenging pattern to achieve. The construction of water and wastewater systems is a costly cornerstone of this kind of development. In order to establish community systems there needs to be a collaborative investment from the development community, the province and the RDN. It would be helpful to discuss the challenges and opportunities involved with developing a compact community and the associated water infrastructure. Through these discussions it would be possible to reveal any regulatory hurdles and identify work-arounds; it would also be possible to highlight any financial disincentives and identify any opportunities such as a density bonus or a reduced development cost charge that could be offered as incentives to promote the construction of innovative water and wastewater systems.
2. **Consult with the Vancouver Island Watershed Steering Committee.** As there are representatives from Ministry of Environment, Vancouver Island Health Authority, other provincial ministries and Regional Districts, this committee offers an inclusive group to discuss water related merits of different development standards. If this group was given a specific mandate to develop a streamlined regulatory approach towards compact developments that utilize innovative water and wastewater systems, this committee could deliberate any required adjustments to provincial regulations and relay them to the Associate Deputy Minister level and petition for legislative change if necessary. This working group is also a venue to learn of successes and challenges that other island Regional Districts are faced with.

7.3.5 Alternate Water Supply (rainwater harvesting and wastewater reuse)



There is great opportunity for development to pilot innovative water solutions. The wastewater reuse design for Sooke Harbour House enables more guests than previously permitted with traditional on-site septic. It also saves money as less potable water is needed for toilet flushing and irrigation.

1. **Provide examples of existing applications.** There exist many examples of successful, tried and tested applications of rainwater harvesting and wastewater reuse that can be presented on the WaterSmart website.
2. **Support and promote pilot projects and case studies.** Demonstration projects are needed to show how a rainwater harvesting or greywater/wastewater reuse system is designed and managed.
    1. The council for the District of Invermere, BC approved the installation of 32 BRAC greywater recycling units in a new subdivision. The use of greywater recycling for toilet flushing will lessen water intake and wastewater outflow.
    2. The Islands Trust Fund received a $35,000 grant from the Vancity and Real Estate Foundations Green Building Grant to install a potable rainwater harvesting system at the Ruby Alton house on Salt Spring Island.

    The RDN could sponsor similar installations and promote a multifamily rainwater harvesting example by working with a developer to build a WaterWise rainwater collection and irrigation system. See Appendix B for details.
3. **Develop guidelines and standards.** Rainwater harvesting and wastewater reuse will be more accessible to a greater majority of people if there are consistent standards to follow.
    1. The City of Portland has a thorough Rainwater Harvesting Code Guide: http://www.portlandonline.com/osd/index.cfm?a=bbehfa&c=ecbbd.
    2. The Islands Trust sponsored the development of a Guide for Regulating the Installation of Rainwater Harvesting systems: http://www.islandstrustfund.bc.ca/projects/pdf/itfrainwaterinstallationregulatingguide.pdf
    3. The State of California publishes a Graywater Standards Guide: http://www.owue.water.ca.gov/docs/Revised_Graywater_Standards.pdf

The development of standards, especially if they are checked as part of a permitting process, (building or other), will help ensure that those wanting to implement an Alternate Water System will do so properly.

A growing rainwater harvesting industry offers many tasteful and efficient design options.

7.3.6 Recommendations for Water Use Bylaws

This study offers a comprehensive approach and all the actions recommended work to lessen summer water use and daily peaks. The water use bylaws deal mainly with pricing and water restrictions and although these are key aspects of water management they are remedies that approach the symptoms of inefficient water use. This study offers proactive approaches in a wide range of policy options to address the root causes of excessive water use.

The RDN already has an evolved incline block-pricing scheme. There is one additional action mentioned above (point 1 of 7.3.1) that can be implemented immediately: Introduce a summer conservation surcharge.

Changing the billing frequency will change revenue very slightly and the only motivation for increased billing, as discussed previously (point 2 of 7.3.1) is the ability to help customers be cognizant of their water use as it is occurring. Voluntary meter reading can work cost-effectively towards this goal.

The Landscape Guide to Water Efficiency, included as an appendix, details all aspects of landscaping and irrigation that promote water efficiency: proper design, optimum soil depth and composition, planting scheme with matching irrigation zones, irrigation scheduling and maintenance as well as best practices for garden care.

After discussion with RDN staff it was concluded that the main focus of analysis for this study is residential water use. The number of commercial businesses in comparison is small. The outside watering practice of commercial businesses can be addressed by the same water use bylaws as residential units. Indoor water use practices of commercial businesses, especially those in the hospitality industry, should be addressed through targeted rebate and appliance and fixture retrofit campaigns.

A comprehensive amendment to the water use bylaw would be to permit an exemption from watering restrictions if a house is Water Smart Certified. There would need to be a larger program to develop the Water Smart Certified criteria, audit homes and monitor success. Components of this program would include:

1. Eligibility for a Water Smart Certificate based on landscape and irrigation design as well as indoor fixtures and appliances.

Awarding conservation efforts with recognition like the Water Hero Award in Nevada can provide incentive for the adoption of water saving practices.

2. A little sign designating the home as Water Smart would be placed in the front yard so passers-by would know why watering might occur on non-watering days.
3. Once a household receives the Water Smart designation, the water use rates would be tracked and depending on the volume of water used, the household would receive a silver, gold or platinum rating similar to LEED building certification.
4. A Water Smart certification table would establish water use rates for each rating level based on the number of residents and lot size.
5. Each home would receive a yearly sticker that reflects their silver, gold or platinum status, in similar fashion to yearly insurance stickers, based on their water use for the previous year.

The additional side benefits of this program would achieve many of the principles of Community Based Social Marketing. The Water Smart signs would increase visibility and spread the message. The silver, gold and platinum designations would inspire competition. The yearly evaluation would confirm commitment. The high visibility and challenge to become Water Smart would catalyze neighbourhood discussion, become a topic at community events and over time establish water efficient practice as normal behaviour.

7.4 Full Range of Implementation Recommendations

In order to achieve a 33% reduction in water use, a broad campaign over many years will need to be orchestrated. Below are a series of tables that lists key enabling actions to initiate for each group of water saving applications. The sequence of actions in these tables follows the general timeline as discussed in the three strategies:

1. Set the stage with education, case studies and pilot projects.
2. Increase the momentum with enabling guidelines, standards and regulations as well as incentives, rebates and promotions.
3. Ensure efficiency with regulations where appropriate.

The publication of milestones and targets reached will keep attention focused on the goal. There are a few long-term goals to work towards:

1. The establishment of compact development in the regional nodes with innovative and efficient water and wastewater systems.
2. Inclusion of municipalities in a broader collaborative sustainable water use strategy.
3. Work with other water related agencies to streamline any regulatory process that limits the actualization of innovative water conservation practices, and provide clear guidelines and direction so innovative water use and public health and safety are synonymous.

With these broader aims in mind, the sustainable water use strategy will stay on the right track.

Rainwater Harvesting		
A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
1. Promote rainwater harvesting systems on the WaterSmart website by providing: a. detailed descriptions of rainwater harvesting systems for retrofits and new buildings. b. an interactive calculator to budget amount captured based on roof area on the WaterSmart website. For an example, see http://www.islandstrustfund.bc.ca/projects/rainwater.cfm.	2. Offer a one-time discount on water bill or rebate for installation of an 'accepted' rainwater harvesting system. ('Accepted' means the system meets specified criteria regarding capture and storage; e.g., a rainbarrel would not normally be 'accepted' as a harvesting system.) 3. Retrofit rainwater harvesting and use in District buildings and landscaping to confirm a "practice what you preach" approach. 4. Incorporate rainwater-harvesting technology in the Building Bylaw. 5. On a water service area basis, evaluate the relative cost of upgrading reservoirs versus subsidizing cisterns for irrigation on individual lots. 6. Develop rainwater-harvesting guidelines as an accompaniment to new development. (An added benefit to rainwater harvesting is stormwater attenuation). 7. Offer a density bonus to major developments (e.g., 10-20% increase in unit count) if a substantial percentage (e.g., 50%) of total water use is sourced from rainwater. 8. Collaborate with Provincial agencies, Health Authorities and other local governments to develop standard policy for rainwater harvesting.	9. Incorporate the rainwater harvesting guidelines into: a. Existing Development Permit Areas and/or create new DPAs to which the guidelines would apply; or b. Building Bylaw. 10. In water service areas, require rainwater harvesting and cistern storage for irrigation, toilet flushing and/or laundry needs before a new household can connect to the local water system. 11. For new multi-home developments, require a collective water harvesting system for irrigation purposes – i.e., install line feeds from roof leaders to a central rainwater reservoir or detention vault.

Water Efficiency			
	A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
Landscape, Irrigation	1. Distribute the landscape guide to water efficiency brochure. 2. Post brochures from the Team WaterSmart workshops on the website. The Native Species, Xeriscaping, Garden Design and Natural Pest Control all have helpful information and links. 3. Promote the removal of lawns, or the installation of and retrofit to drought-resistant grass. 4. Develop landscape and irrigation guidelines. 5. Require an irrigation permit. 6. Offer water use audits. 7. Pay partial amount for removal or renovation of an inefficient irrigation system.	8. Sponsor and support the development of water efficient landscape and irrigation designs at public sites: Recreation Centres, Community Centres, Hospitals, etc. 9. Offer a do-it yourself water audit program to help residents assess water usage and means of improvement. As with the Sunshine Coast Regional District practice, a prize can be awarded as part of a draw for people who submit audit records. If permission is granted the audit records can be analysed to help understand use patterns. 10. Offer one-time discounts on water bills for water efficient garden designs. Promote designs through contests and publication of winners. 11. Offer one-time discounts on water bills and for irrigation systems connected to a weather station or other moisture sensor connected with an automatic shut-off device. 12. Offer a one-time discount on water bills if irrigation systems are designed and installed by an irrigation professional: IIABC Certified Irrigation Designer or Certified Irrigation Technician.	16. Require use of weather-based (ET) controllers for all irrigation installations. Pursue separate metering and higher block pricing for peak season outdoor water use.

Water Efficiency	A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
		13. Set standards for landscaping and irrigation professionals. Develop a WaterSmart certification process. 14. Sponsor seminars and lunchtime events to educate landscaping and irrigation professionals about WaterSmart techniques. 15. Develop and ET index for different climate areas in the region and provide Internet access and a toll free number so people can check and evaluate how much lawn water is needed in the coming week. An estimate of water needed for plants and shrubs can be calculated as a percentage of lawn water needed.	
Fixture Retrofits, Leak and Pressure Management	1. Provide information on checking system pressure and properly adjusting irrigation based on available pressure. 2. Promote a yearly fixing leaks and pressure management campaign to tie-in with the Fire Department's annual battery check for smoke alarms. 3. Promote retrofits to water efficient fixtures and appliances.	4. RDN monitor system lines for leaks and to optimize pressure. 5. Dedicate a certain amount of staff time to investigating leaks and informing residents how to repair them. 6. Offer rebates for the purchase of water efficient fixtures, appliances, and major commercial equipment. 7. Work with local municipalities and private water purveyors to develop a region wide rebate program.	8. Update Building Bylaw to require water efficient fixtures and appliances.

Administration			
	A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
Metering and billing	1. Read water meters monthly in the radio-based metering pilot project area. 2. Provide information on WaterSmart website detailing how residents can read their own meters and provide web-based calculators to help residents assess what the meter readings mean in terms of usage and cost. 3. Coordinate with BC Hydro to ensure that future Smart meters are designed and ready to read water meters as part of the province-wide meter conversion program.	4. On the WaterSmart website, provide information on water use efficiency measures taken at RDN buildings (e.g., Hammond Bay offices, Oceanside and Ravensong) and ongoing statistics on level of water use. 5. To further promote residential meter reading: a. develop a reporting form and fact sheet on how to read a meter and insert it into water bills. b. design a website page to be able to receive meter readings from 'registered' users, and return usage and cost summaries. 8. Provide an interactive webpage on the WaterSmart website where residents can enter their monthly water use and see how this amount compares with other residents of the system. Include on this webpage a variety of water calculators that detail information such as: a. cost for amount of water divided into block rates, b. amount of rainwater that could be collected from the roof, c. amount of water needed to irrigate different lawn sizes, d. all aspects of water use with the ability to adjust amounts for each water use practice and see the resulting change in volume and	10. With the inclusion of 'Smart' meters, present continuous time information on the Internet regarding water use; password protected for each resident's meter, and open to the public for grouped use statistics on each water service area. Also include information on the state of the water resource to balance the view: current water levels (groundwater) or base flow levels (surface water sources) in comparison with dry and wet years.

Administration	A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
		price, etc. 9. Provide information with water bill to graphically show use in comparison with weather, average and efficient users and the cumulative effect of this use pattern. i.e. if all people where high users, the system would be taxed, and more infrastructure would need to be built.	
Pricing	1. Introduce a summer conservation surcharge 2. Charge a water use impact fee to ensure proper irrigation installation.	3. Develop rational to refine base allocation of water. Use winter use rates as a starting point for indoor amount needed and base outdoor use on amount of turf along with weather conditions that affect watering or based on the needs of a water efficient garden or based on the needs of average to low water users in the water service area. For a benchmark: it takes approximately 330 litres per day to water 1000 square feet of lawn 1 inch per week.	4. Work with the Province, other agencies and water researchers (e.g., POLIS institute for Ecological Governance at UVIC. - http://www.polisproject.org/) to define an intrinsic value for water. 5. Add a component of price for the intrinsic value of water. 6. With the inclusion of 'Smart' meters, adjust pricing policy to manage daily as well as yearly peak demand.
Water restrictions (seasonal)	1. Other actions reduce the need for watering restrictions. Develop background policy and WaterSmart certified program	2. Lift restrictions for households that are WaterSmart certified.	

Wastewater Reuse		
A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
1. Include information on Water Smart website detailing water reuse (greywater and blackwater) policies and case studies for other regions in the world. 2. Collaborate with the Province, VIHA, other local governments and wastewater engineers to develop policy for multifamily residential as well as commercial, industrial and institutional reuse projects. 3. Foster the adoption of water recycling practices for all new large developments. 4. Stay in contact with other reuse projects in British Columbia to share successes and learn of new opportunities.	5. Organize the development of a demonstration greywater/wastewater recycling project that uses the sub-surface method for treatment and dispersion. 6. Organize a pilot study for the installation of indoor greywater technology systems and develop guidelines for proper practice. 7. Showcase a business or development that installs a greywater or wastewater reuse system for irrigation, toilet flushing, and/or laundry. 8. Offer a density bonus to developments that implement water reuse strategies.	9. Develop a standard for home-based wastewater sub-surface irrigation systems and develop a flexible permitting process. 10. Include the installation of indoor greywater recycling and outdoor wastewater technology in the Building Bylaw with appropriate permitting. 11. Offer a discount in building permit fees for homeowners who install greywater systems for either sub-surface irrigation or indoor recycling. 12. Require all new homes to have plumbing for three inputs; recycled wastewater or greywater for toilet flushing and irrigation, rainwater for laundry and domestic cleaning and well or municipal water for potable needs. 13. Require water intensive industrial businesses to look first for reclaimed water. 14. Require all new septic installations to produce effluent to a secondary or tertiary standard and to distribute effluent to a subsurface irrigation system. 15. Require new sewage treatment facilities of any size to treat water to a level ready for reuse and identify customers for water distribution. 16. Build Constructed Treatment Wetlands to handle effluent from larger sewage treatment systems and promote the integration of natural ecosystems within the human hydrologic cycle.

Public Awareness and Involvement		
A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
1. Hire a Water Efficiency Coordinator. 2. Create a workshop series (e.g., lunch-time 'brown bag') for the development and building sector to promote: a. rainwater-harvesting b. efficient landscaping and irrigation c. leak management d. wastewater reuse 3. Enhance the development of the Team WaterSmart website www.teamwatersmart.ca and include a variety of water use calculators so residents and business can budget their water use and plan appropriate conservation strategies. Also include PDF versions of all information brochures, pamphlets and workshop series materials. 4. Choose a theme for each summer. The suggestion from the past Program Coordinator is to continue the 2007 theme of "Rain Gauges" for 2008, as there was a high adoption rate in 2007 and rain gauges can be an inexpensive and easy way to curb excessive watering. One easy method is to offer free rain gauges at local nurseries. 5. Work with local community groups and NGOs to secure funding and grants for	9. Expand and evolve Team WaterSmart with or without membership from other local municipalities. The benefits will trickle down and the municipalities may join in with continued success. 10. Create a WaterSmart certification for businesses and residents. The certificate would be based on the ability to meet certain criteria. 11. Present two WaterSmart awards a year: one for homeowners and another for businesses to honour the candidates who are able to cut water usage (percentage basis) by the greatest amount. 12. Expand door-to-door and water audit campaigns. 13. Create age appropriate school programs to inform children and teenagers about water science and water conservation specific to the Region. 14. Sponsor science fairs and a regional water fair with awards for water conservation projects. 15. Promote various contests and campaigns for high school students and/or residents: rain barrel/cistern painting, water efficient garden, water efficient mailbox planting, etc.	16. Increase the number of coop terms. 17. Promote a Water Retrofit contest. The contest would request residents or businesses in the Region to detail the steps taken, costs involved and cumulative water savings of the various efficiency measures they choose to take. A detailed summary would be written into a water biography posted on the RDN website and these residential water biographies would be distributed via mail as an addition to the water bill. These stories would prompt people to look at their own usage and see what steps they can take to conserve. Commercial, industrial and institutional entities could also volunteer as conservation case studies. Prizes would be awarded to those who save the most water in either a residential or commercial group. 18. Check in routinely with the public and businesses via surveys, focus groups, etc. to see what information and programs they need to achieve water efficient behaviour.

Public Awareness and Involvement		
A. Short Term Improvement (next 2 years)	B. Middle Step (2 – 4 years)	C. Long Term Vision (4 years+)
water conservation initiatives. 6. Establish a quarterly meeting with RDN staff, the province, developers and real estate agents to strategize the promotion of WaterSmart development. 7. Collaborate with the Vancouver Island Watershed Steering Committee. 8. Support and promote pilot projects.		

7.5 Towards a Water Conservation Plan

This explorative study contains much of the information needed to develop a Water Conservation Plan. Further information to develop a comprehensive Water Conservation Plan could include:

- An assessment of water availability for future population balanced with awareness of ecosystem needs
- Details of future infrastructure needed to address water quality and quantity issues
- Reference to operation and maintenance plans for specific water service areas
- Strategies to address the relationship between community water/sewer infrastructure, zoning and regional growth strategies; in particular the role of Package Sewage Treatment Plants
- Methodologies for routine monitoring of watershed health, groundwater availability and community water system quality and quantity
- Reference to an integrated strategy for public awareness and involvement initiatives as the majority of water conservation will be achieved through individual actions of the general public as well as industrial and business operations
- Plan for routine reassessment and adaptive management of the Water Conservation Plan

8.0 Potential Funding Opportunities

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
New Deal – General Strategic Priorities Fund and Innovations Fund	Government of Canada Province of BC UBCM	Under the Canada/BC/UBCM Agreement on the Transfer of Federal Gas Tax Revenues (GTZ), funding is available to local governments and other eligible recipients through the following five funding programs: General Strategic Priorities Fund; Innovations Fund; Community Works Fund; Strategic Priorities Fund; and Regionally Significant Projects Fund. **Details regarding a new application round is expected to be announced in late November 2007** Eligible Planning Projects Any capacity building or Integrated Community Sustainability Planning (ICSP) is eligible if, in the case of a GSPF application, the project is larger in scale or regional in impact, or in the case of an IF application, the project represents an innovative approach to achieving the GTA's desired outcomes. Examples include: ◆ Regional growth strategies ◆ Community development plans ◆ Transportation plans ◆ Infrastructure development plans ◆ Long-term cross-modal transportation plans ◆ Water conservation/demand management plans ◆ Greenhouse gas reduction plans ◆ Implementing/planning innovative environmental technologies that support sustainability	http://www.civicnet.bc.ca/siteengine/ActivePage.asp?PageID=294
National Water	Agriculture and	The National Water Supply Expansion Program (NWSEP) is a multi-year,	http://www.agr.gc.ca/env/in

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
Supply Expansion Program	Agri-Food Canada	$60-million Canada-wide initiative that will help improve the capacity of Canada's agricultural community to address water supply concerns. In British Columbia, the agreement is the Canada-British Columbia Water Supply Expansion Program (CBCWSEP). Through this initiative, British Columbia producers have access to support - both technical and financial - for the planning and development of projects that will improve their ability to develop and enhance long-term, sustainable agricultural water supplies. The CBCWSEP funds three types of projects. These are: • Tier One - On-farm water infrastructure projects: individual on-farm water projects such as wells, dugouts, water storage systems, and pipelines. • Tier Two - Multi-user infrastructure projects: larger scale projects which provide water to a number of water users, such as tank-loaders and regional pipelines, and that will lead to growth in the agricultural sector. • Tier Three - Strategic work projects, which include: activities (e.g. regional groundwater studies, groundwater exploration or testing, regional water management planning and feasibility studies, information extension activities, etc.) that will serve to increase opportunities for strategic partnerships and to enhance understanding of the operational and developmental limitations to the water resources in their communities and/or regions. Rural communities and municipalities are eligible to apply for Tier Two and Tier Three Funding. Canada will contribute up to one-third of the eligible costs for Tier Two funding. For Tier Three funding, cost-sharing arrangements may vary and will be determined and approved on a project-by-project basis. In total, the Government of Canada is providing $5.6 million for projects in British Columbia over three years. The Province of British Columbia will provide in-kind support through technical and administrative assistance. Note the program has four application periods each year. These are	dex_e.php?section=h2o&page=h2o

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
		January 1, April 1, June 1, and September 1.	
Towns for Tomorrow	Act Now BC	**Towns for tomorrow** opens the door for BC's smaller communities to improve their local infrastructure and become even better places to live and work. Projects supported include water quality and energy improvements, enhancement of protective and emergency infrastructure services, as well as the development of recreation, tourism or cultural amenities with long-term benefits for local citizens. Local governments with populations of 5,000 or less and the Central Coast Regional District can apply for Towns for Tomorrow grants. Under the cost-share program, the Province will provide 80 per cent of the funding for approved projects, with communities funding the remaining 20 per cent, up to a maximum total value of $500,000. A total of $7 million is available each year for the next three years.	http://www.townsfortomorrow.gov.bc.ca/
Green Municipal Fund	Government of Canada Federation of Canadian Municipalities	The GMF operates at arms-length from the federal government, and supports municipal governments, and their partners, to improve to quality of our air, water and soil, and reduce greenhouse gas emissions. GMF funding supports a range of activities related to municipal environmental projects, from the early stages of project design unto and including the physical implementation of capital projects.	http://www.sustainablecommunities.fcm.ca/GMF http://www.sustainablecommunities.fcm.ca/GMF/GMF_Request_for_Proposals.asp
Green Building Grant Program	Vancity and the Real Estate Foundation of BC	The Green Building Grant Program was established by the Real Estate Foundation and Vancity Credit Union with two goals: minimize the impacts of climate change and improve sustainable land use practices by supporting green building initiatives in British Columbia. The overall goal of the funding program is to reduce CO2 emissions resulting from settlement activity. Each year, the Program will provide one or more grants (up to $50,000 each) to qualified recipients, totaling at least $100,000. Applications will	http://www.realestatefoundation.com/greenbuilding.html

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
		be accepted from not-for-profit organizations, including charitable organizations and cooperatives. **November 1 deadline 2007**.	
Fresh Water Resources Protection Grant Program	Walter and Duncan Gordon Foundation	The Gordon Foundation's goal for the Fresh Water Resources Protection Program is: *To support the development of a comprehensive legal, regulatory, and citizen action framework for the purpose of protecting the quality and quantity of fresh water resources for future generations of Canadians.* Funding provided through the Fresh Water Resources Protection program has 2 objectives: 1. Demand management: To shift the orientation for water management in Canada to demand management. The Gordon Foundation supports projects that focus on reducing the demand for water (i.e. consumption) in Canada. 2. Groundwater protection: To understand and protect our groundwater resources. The Gordon Foundation recognizes there is a need for cooperative dialogue about the management of groundwater resources, particularly those that cross borders. There is also a need for evaluating the state of groundwater knowledge, current legislation permitting groundwater use, and monitoring of actual use across the country. The Gordon Foundation funds projects that address these needs. In addition, as the program evolves, the Gordon Foundation will support the development of Canadian perspectives on inter-jurisdictional issues of water management and Canada's role in managing water as part of the global commons. This program is open to charities and donees (including municipalities). Applicants are encouraged to make contact with the Foundation to determine if the proposed project fits within their mandate. Proponents of project ideas deemed applicable will be invited to submit a detailed application to the Foundation.	http://www.gordonfn.org
Smart Development	BC Ministry of Community	Land use patterns dictate the character of communities in British Columbia, and the costs of infrastructure and servicing development. Land use patterns	http://www.cserv.gov.bc.ca/lgd/intergov_relations/smart_

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
Partnerships Program	Services	are planned by local governments and built out by private individual and corporate sector interests. Partnerships between those who plan and those who invest have the potential to result in better decisions for municipal and regional governments, that also benefit provincial areas of interest. Facilitating these partnerships is an integral part of the ministry's work to support local governments in their efforts to plan and make land-use decisions to benefit their communities. Partnership projects focus on key priorities, including: ◆ building co-operation among local governments and between local governments and the province; ◆ encouraging innovation and capacity building in local government planning and decision-making; ◆ improving housing affordability; and ◆ promoting efficient and cost-effective infrastructure. Funding is shared between partners with the Ministry typically providing up to 50% of the local government's costs, up to a maximum of $50,000. Projects are usually managed by a local government partner. Deliverables: ◆ Model bylaws ◆ Policy guides for elected officials ◆ Technical guides for staff ◆ Decision support tools ◆ Streamlined approvals protocol	development/index.htm

NAME	SPONSORING AGENCIES	DETAILS	WEBSITE
		• Outreach and continuing education programs • An identification of "next steps" • Lessons learned	
Infrastructure Planning Grant Program	BC Ministry of Community Services	The grants are provided for projects that study the feasibility, costs, technology and location of proposed sewer, water, drainage or transportation facilities. The maximum grant for approved studies is $10,000. Applications for projects proposed under the Canada-British Columbia Infrastructure Program "green" local government infrastructure, announced in October 2000, may benefit from the successful completion of an infrastructure planning study.	http://www.cserv.gov.bc.ca/lgd/infra/library/infra_planning_grant_program_guide.pdf
Vancouver Foundation Funding Program	Vancouver Foundation	Funded activities often provide a direct service to the community, or take an innovative approach to a community concern. Vancouver Foundation is responsive to changing community issues and priorities. Both capital and planning projects considered. The first part of the application process is to submit a letter of inquiry by either January 17, 2008 or July 31, 2008. Completed grant applications are due by February 28, 2008 September 11, 2008.	http://www.vancouverfoundation.bc.ca

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Personal Communication:

Bob Burgess, Owner, Rainwater Connection, http://www.rainwaterconnection.com/
Dr. Khosrow Farahbakhsh, P.Eng, Assistant Professor, School of Engineering, University of Guelph, http://www.soe.uoguelph.ca/webfiles/khosrow/index.html

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Appendix A. Landscape and Irrigation Brochure

Appendix B. Water Wise Approach

Appendix C. San Bruno Guide for Landscape and Irrigation Design Standards