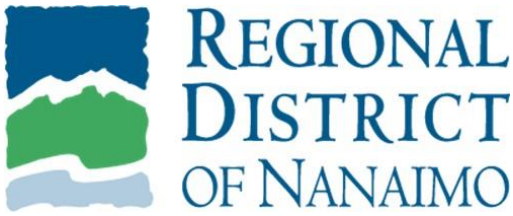
Regional District of Nanaimo
Water Service Areas
Water Conservation Plan - 2020-2030



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Executive Summary

The Regional District of Nanaimo (RDN) is committed to providing residents and businesses within its nine Water Service Areas (WSAs) with ample, high quality drinking water. By using this invaluable resource as efficiently as possible, together we can ensure that it will be there for us all in the future.

Building on its 2013 predecessor (Aquavic, 2013), this updated Water Conservation Plan sets out a refreshed direction for the decade from 2020 to 2030. It provides objectives for this next operational period, sets out a renewed program and suite of measures, establishes data-based targets, and outlines implementation strategies and schedules. The scope applies to the nine RDN WSAs listed in the following table:

RDN's Water Service Areas

Water Service Area	Year Established	Water Source	Number of Connections
Decourcey	1998	Groundwater (1 well)	5
Englishman River	2003	Groundwater (well series)	151
French Creek	1980	Groundwater (well series)	238
Melrose Terrace	2005	Groundwater (1 well)	28
Nanoose Bay	2005	Groundwater supplemented from Englishman River	2205*
San Pareil	1999	Groundwater (well series)	288
Surfside	1986	Groundwater (2 wells)	39
Westurne Heights	2016	Groundwater (1 well)	17
Whiskey Creek	2011	Surface water (Crocker Creek)	125

From a community sustainability perspective, conservation will contribute to making RDN's water supplies more resilient to seasonal and longer-term droughts. Climate change will place more stress on drinking supplies and environmental flows for fish and ecosystems. To mitigate this, decreasing per capita use is a top priority. Addressing high summer use is another priority. Controlling seasonal spikes in consumption will enable RDN to maximize existing infrastructure and may contribute to deferral of costly capital upgrades.

Water Conservation Plan Objectives

The following supporting objectives will guide implementation of this plan:

- continue to reduce per capita production and consumption in all WSAs year round;
- continue to reduce peak demand in the summer in order to better prepare for climate change impacts and improve resiliency to drought and other water shortages;
- focus resources to provide additional support to residents or WSAs with above average demand;
- improve understanding of non-revenue water and better manage system losses from leakage and other sources;
- support RDN's asset management program; and,
- foster a water stewardship ethic and ensure we collectively act as good neighbours to surrounding communities who share use of our aquifers and streams.

While the scope of this plan focuses narrowly on water conservation within the boundaries of RDN's WSAs, the objectives above are nested within the broader vision, mission and goals of the regional DWWP Action Plan 2.0.

2020 - 2030 Water Conservation Program

The updated program builds on years of work by RDN, partners and residents under RDN's Team WaterSmart program, the 2013 Water Conservation Plan, and the DWWP Program. It places strong emphasis on helping residents becoming more efficient and positioning RDN to make better-informed decisions around water management in the future. In some cases, the measures are enhancements of tools that are already in place. In other cases, new programs will be developed and implemented. Actions are organized around five themes:

1. **Reduce Outdoor Water Use**: enhance effectiveness of existing incentives and regulations to help residents reduce outdoor irrigation of lawns and gardens.

2. **Implement a Commercial, Institutional and Multi-Family Residential Pilot Project:** help the small group of WSA customers that do not fall into the single family residential category control their consumption.

3. **Review Water Service Rates to Optimize Conservation-Orientation:** as part of a planned review aimed primarily at ensuring revenue sufficiency, review rates and the rate structure to ensure they provide incentives to conserve.

4. **Improve Water Use Accounting and Management of Non-Revenue Water:** improve data on consumption and production, identify sources of non-revenue water including leakage, and implement appropriate measures to control losses.

5. **Continue Team WaterSmart Outreach Implementation:** raise awareness of the importance of water conservation, assist residents to reduce use indoors, continue outreach to youth, and foster a community stewardship ethic.

The following table provides a summary of the program measures under each theme, their current status, and the sectors they target.

2020-2030 Water Conservation Plan Program Summary

Theme	Code	Measure	Status	Sector
#1 Reduce Outdoor Water Use	1.1	Residential irrigation system check-ups	Enhance	Residential
	1.2	Irrigation upgrades and soil improvements rebate	Continuing	Residential
	1.3	Outdoor watering restrictions	Continuing	All
#2 Commercial, Institutional and Multi-Family Residential Pilot Project	2.1	Commercial, institutional and multi-family pilot project	New	Commercial, Institutional and Multi-Family
#3 Review Water Service Rates	3.1	Water service rate review	Enhance	All
#4 Improve Water Use Accounting and Management of Non-Revenue Water	4.1	Water use accounting improvement and water audit	Enhance	Water Utility
	4.2	Non-revenue management water and reduced system losses	Enhance	Water Utility
#5 Continue Team WaterSmart Outreach Implementation	5.1	Team WaterSmart publications, events and online resources	Continuing	Residential
	5.2	Team WaterSmart youth outreach	Continuing	Residential
	5.3	Rainwater harvesting rebate	Continuing	Residential

Plan Targets and Implementation

RDN will pursue realistic water production and use targets to measure success towards implementation of this plan, as follows:

Target 1: Residential Consumption

- Reduce single family residential consumption by 15% to 275 liters per capita per day (LCD) by 2030, benchmarked against 323 LCD in 2018/19.

Target 2: Peak Season Demand

- Maintain maximum month average day total water production at or below 5,300 cubic meters per day, benchmarked against the July 2018 daily average.

Target 3: Non-Revenue Water

- Quantified target to be established as an early implementation priority.

Implementation will continue between 2020 and 2030. Early priorities include the following:

- complete a water audit commencing in 2020 to improve understanding of non-revenue water and sources of loss;
- based on water audit results, develop and commence implementation of an ongoing system loss management program in 2020/21;
- in 2021, identify and implement enhancements to the irrigation system check up program;
- in 2022, conduct a water services rate review that includes investigation of conservation-oriented pricing in its scope; and,
- in 2023, design and implement the commercial, institutional and multi-family residential pilot project.

Plan implementation will be led by RDN's Water Services Department. Regular progress reports will be provided to the RDN Board. Consistent with the path set out in the DWWP Action Plan 2.0, implementation will follow an adaptive management framework. This means learning from experience and responding as needed to fine-tune delivery in response to feedback and outcomes.

By continuing to encourage efficient water use, this plan will play an integral role in making WSA communities more sustainable. It will help us adapt to future pressures from climate change and provide a range of other social, ecological and financial benefits. It will also support ongoing pursuit of the DWWP Action Plan 2.0's vision for healthy, safe and resilient water resources in the region, enabled through strong partnerships.

1.0 Introduction

The Regional District of Nanaimo (RDN) is committed to providing residents and businesses within its nine Water Service Areas (WSAs) with ample, high quality drinking water. By using this invaluable resource as efficiently as possible, together we can ensure that it will be there for us all in the future. This is particularly important in light of a changing climate, which will place increasing pressure on streams and aquifers and may lead to increased scarcity as summers become drier and longer.

In 2013, the first RDN Water Conservation Plan was completed (Aquavic, 2013). Implementation commenced in 2014. This updated Water Conservation Plan sets out a refreshed direction for the decade from 2020 to 2030. It provides objectives for this next operational period, sets out a renewed program and suite of measures, establishes data-based targets, and outlines implementation strategies and schedules. It balances between ensuring that customers can use water to enjoy the amenities of their homes, businesses and outdoor spaces while continuously improving efficiency. It also supports ongoing implementation of RDN's Drinking Water and Watershed Protection (DWWP) Action Plan 2.0 and its vision for healthy, safe and resilient water resources in the region, enabled through strong partnerships.

The plan has seven main parts, as follows:

- Section 2 discusses the benefits of water conservation;
- Section 3 provides background and history on the plan;
- Section 4 is an overview of the WSAs and a profile of water use;
- Section 5 sets out the plan objectives;
- Section 6 is a brief inventory of current water conservation programs;
- Section 7 outlines the 2020 - 2030 Water Conservation Program under five themes;
- Section 8 provides a high level implementation plan including targets, a schedule, early priorities, and a monitoring and evaluation framework.

How This Plan Was Developed

Creation of this updated plan commenced in early 2020. The first step involved a review of RDN's current conservation program including strengths, challenges and opportunities (see Technical Memo #1). Subsequent steps included quantitative analysis of water production and consumption trends building on recent RDN analysis (see McSorley, 2018b), and demand forecasting (see Technical Memo #2). Work was facilitated by a series of virtual workshops with RDN staff engaged in utility management and conservation program administration. These workshops looked at issues such as program objectives, targets, delivery themes and measure selection. Feedback from the community was solicited via the RDN "Get Involved" online portal, which included information about the project and a short survey. This was advertised via information in a utility bill insert and social media posts. Plan development was generally guided by direction in the Province's Water Conservation Guide (Province of BC et. al., 2013) as well as North American industry best practices as set out in AWWA (2006), AWWA (2013), Maddaus (2014), and Vickers (2001).

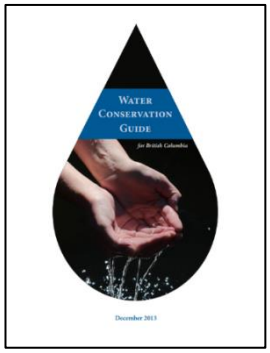

Figure 1: BC Water Conservation Guide

2.0 Benefits of Water Conservation

Benefits of conservation vary from community to community depending on capital expansion plans, operating costs, energy use, the current demand profile, the water loss rate, and environmental drivers, among other factors. However, some typical environmental, financial, and community benefits residents might gain from implementation of this plan include the items listed in Table 1, below.

Table 1: Benefits of Water Conservation

Community Benefits	**Financial Benefits**
• enhanced resilience to prolonged drought and a changing climate • retained water in aquifers and reservoirs for firefighting and other emergency needs • potentially enhanced drinking water quality, particularly during times of shortage • enhanced aquatic recreation opportunities • greater equity and fairness (those who waste and put excessive demand on the system will pay more than those who conserve) • mitigated or avoided saltwater intrusion for coastal wells (particularly pertinent to Decourcey, San Pareil, Surfside, and Nanoose WSAs) • promotion of a stewardship ethic within the community; offers ways for individuals to reduce their own ecological footprints	• deferred or avoided capital investment in new bulk supply and treatment infrastructure (i.e., needs are met with conservation rather than new supplies) • reduced operations and maintenance costs • avoided costs for RDN and for residents from reduced energy use with less water pumping and heating • improved chances of Provincial and Federal Government infrastructure funding and other grants by adoption of best practices • reduced peak demand – the point at which water use is greatest (usually hot summer days) - provides the opportunity to downsize new pipes, pumps, treatment plants and reservoirs, resulting in significant cost savings
Environmental Benefits	**Policy and Legislative Linkages**
• reduced or avoided impacts from construction of new infrastructure • reduced chemical use and disposal in water and wastewater treatment • reduced sewage disposal to the environment • reduced energy use and greenhouse gas emissions due to reductions in water treatment and pumping • enhanced stormwater attenuation on the land during heavy rainfall events (for example, improved soils hold more water longer) • maintained environmental flows for streams, fish and aquatic ecosystems	• supports objectives in the *RDN Board Strategic Plan 2019-2022* • supports objectives in RDN's *Regional Growth Strategy* • Supports objectives in RDN's *Asset Management Policy* • Supports objectives in RDN's *Liquid Waste Management Plan* • supports implementation of the *Drinking Water and Watershed Protection Action Plan* • contributes to meeting obligations under the Province's *Water Sustainability Act*, *Drinking Water Protection Act* and *Environmental Management Act*

From a community sustainability perspective, conservation will contribute to making RDN's water supplies more resilient to seasonal and longer-term droughts. Within our region, climate change models project increases in hot and dry conditions (RDN, 2020a). More precipitation will fall as rain due to warmer winter temperatures, which results in less snowpack accumulation at elevation (RDN 2020b). Long-term drawdown of aquifers is also a concern. All of this could place more stress on drinking supplies and environmental flows for

fish and ecosystems in creeks that rely on seasonal groundwater contributions for baseflow. To mitigate this, decreasing per capita use is a top priority.

As discussed below in Section 4.2, addressing high summer use and peak demand is another priority. Peak demand is the largest volume consumed in the WSAs in a single month, day or hour. This normally occurs in summer, coinciding with heavy lawn and garden irrigation and other outdoor use. In RDN's WSAs, this can sometimes double average demand, setting a key parameter for infrastructure design. System components (e.g., pipes and wells) must be sized large enough so they can meet demand at peak times, as well as provide extra capacity for firefighting.

Decourcey WSA, for example, depends on a single coastal bedrock aquifer. High summer use over the past few years has resulted in the need to enforce Stage 4 restrictions year-round to protect the well. Alternative sources will be difficult and costly to build for a small customer base. In Englishman River WSA, peak demand has begun to push up against pending Provincial licence allocations, and the Region has been forced to seek approval for an additional well. These examples illustrate how excess seasonal consumption place stress on the environment and create new costs for customers. Efforts to control these spikes in consumption will enable RDN to maximize existing infrastructure and may contribute to deferral of costly capital upgrades.

3.0 Background and History

This plan builds on decades of efforts aimed at improving efficiency and fostering a community sustainability ethic both in the RDN WSAs and across the region. RDN first passed bylaws prohibiting water waste as early as 1986. Through the 2000s, interest in watershed protection grew and the RDN Board identified this as a priority in its 2003-2005 Strategic Plan. This ultimately led to completion of the original DWWP Action Plan in October 2007. That plan identified education and outreach as a central theme, with associated goals to 1) promote awareness and stewardship of the watersheds and drinking water resources in the Region; and, 2) promote efficient water use in all sectors (Lanarc, 2007).

In 2008, a referendum in RDN's electoral areas led to creation of a drinking water and watershed protection service under RDN Bylaw 1556-0. Implementation commenced in 2009 with the following purposes:

a) increase the level of knowledge regarding drinking water sources to support the long-term sustainability of the water resource;
b) coordinate efforts of provincial and local governments and non-governmental organizations with respect to drinking water source protection;
c) increase the level of public awareness regarding drinking water and watershed protection requirements and strategies (RDN, 2008).

Throughout the 2010s, RDN continued to expand and improve its conservation program under the Team WaterSmart banner, bolstered by the region's four municipalities' decision to join in and support this work and the DWWP Action Plan more broadly. This greatly expanded resources and reach.

In 2013, RDN commissioned a Water Conservation Plan, completed by Victoria-based AquaVic. Like this plan, its scope was limited specifically to RDN's WSAs (numbering eight at that time). However, it also provided an example for other service providers in the region to create their own plans for their areas. It followed a planning framework set out by the Provincial Government (Province of BC, 2013) and assessed current and historical community demand and non-revenue water trends. It also set out several recommendations to add to existing conservation measures between 2014 and 2016. Finally, it set two targets for the WSAs:

- reduce average residential water use by 33% between 2004 and 2018 (a target first set in HB Lanarc, 2008); and,
- maintain maximum month water production at or below 2004 levels until 2018.

An internal assessment of progress specially on the WSA Water Conservation Plan was completed in 2018. This report examined historical trends in water use and production in each WSA and summarized attainment of program milestones. It found that, across all nine WSAs, average annual daily use per connection decreased steadily from 2004 to 2017 and that maximum month production remained below the 2004 reference level from 2011 to 2017 (McSorley, 2018b).

Also in 2018, Econics completed a comprehensive third party review of progress toward implementation of the DWWP Action Plan generally, including work on education and outreach. The report found that, overall, the program had been "remarkable and highly successful" at pursuing its goals (Econics, 2019). With respect to outreach and education specifically, major accomplishments over the past decade include the following:

- the program has created and disseminated an impressive array of water conservation and sustainability resources;
- there has been innovation in developing unique and regionally relevant education programs; and,
- partnerships for regional service delivery have been highly successful.

This 2018 review also identified a number of areas for potential enhancements, including improving branding and design, reducing the information intensity of campaigns to focus more on key messages, and innovation in how demand management programs are delivered (for example by using community-based social marketing techniques).

Today, RDN continues to deliver water conservation outreach to all residents in the region, including to its own customers in WSAs. This service is functionally administered by RDN's Regional and Community Utilities division, although several other departments are also involved. The RDN Board is ultimately responsible for program governance, supported by a community and stakeholder Technical Advisory Committee that advises on implementation.

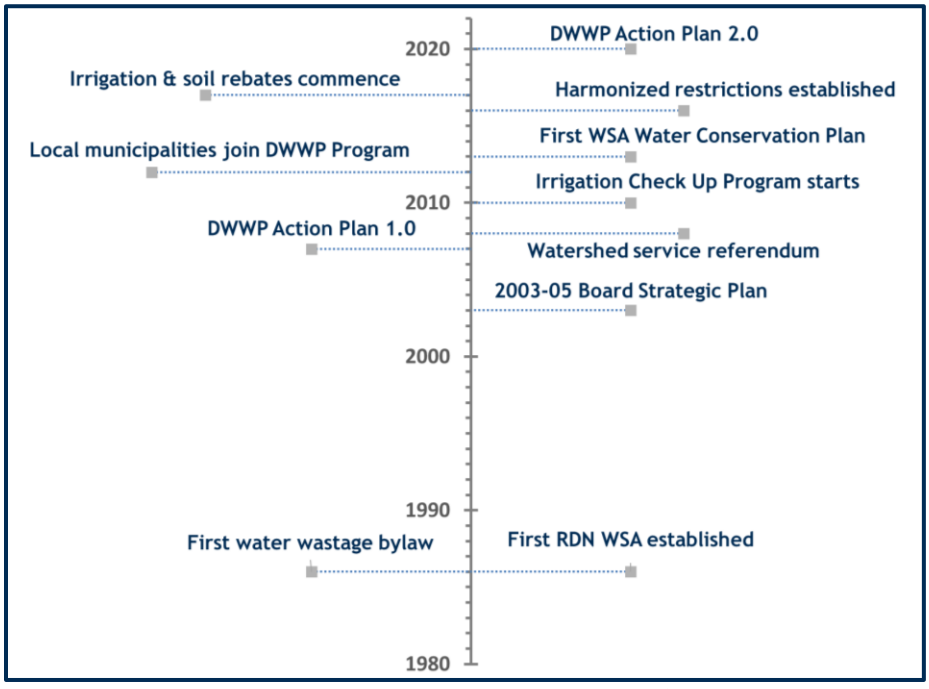

Figure 2: RDN Water Conservation Milestones

In 2019, RDN commenced an update, renew and refresh of the DWWP Action Plan, concluding in early 2020. This was driven by a multi-stakeholder structured decision making process, a resident survey and other public input, feedback from RDN departments and consultation with technical experts.

The DWWP Action Plan 2.0 retains alignment with the original objectives of the 2007 plan with increased focus on emerging challenges and priorities such as climate change. It is organized under three themes:

- Water Awareness & Stewardship;
- Water Information & Science; and,
- Water-Centric Planning & Policy Support.

Actions pertaining to water conservation are generally categorized under the Water Awareness & Stewardship theme. Ones particularly relevant to this Water Conservation Plan are summarized in Table 2.

Table 2: Select Relevant Actions and Sub-Actions from DWWP Action Plan 2.0

#	Action	Continuing Sub-Actions	New Sub-Actions
5.1.1	Enhance Water Awareness Through Community-Based Team WaterSmart Outreach	• Tours • Community events • Curriculum-connected school materials • Irrigation Check-ups • Workshops	• Community-based Social Marketing program design • Multi-media engagement • Interpretive signage and demonstration sites • Youth water leadership projects • Public surveys
5.1.2	Incentivize Sustainable Practices (Rebates)	• All current rebates	• Explore new rebate options (e.g. water flow meters for wells)
5.1.3	Create Team WaterSmart Campaigns to Target Strategic Sectors	• N /A	• Agricultural water stewardship • Commercial, institutional, industrial water stewardship
5.1.5	Coordinate with Water Service Providers	• Support small water systems • Coordinate regional watering restrictions communications	• Support regional water conservation plans

Source: Excerpted from RDN (2020b, p. 39)

The DWWP Action Plan 2.0 will guide implementation of the conservation program described in this document from 2020 to 2030 and beyond.

4.0 Water Service Areas Overview and Water Use Profile

This section provides a brief overview of RDN's nine WSAs and a summary of recent water production and consumption trends.

4.1 Systems Overview

The nine WSAs within the scope of this plan are listed below. For more information on their history and infrastructure configuration see RDN (2020c) or AquaVic (2013).

- **Decourcey** – RDN's smallest WSA with only 5 residential connections, established in 1998 in the rural area south of Nanaimo.
- **Englishman River** – established in 2003, situated in the area near the southern boundary of Parksville between the Island Highway and the Englishman River.
- **French Creek** – RDN's third largest system with 288 connections, established in 1980, and located south of the Island Highway between Parksville and Qualicum Beach.
- **Melrose Terrace** – another small system with 28 connections, established in 2005, and located near the Alberni Highway southwest of Coombs.
- **Nanoose Bay** – the largest system by far under RDN's administration with about three quarters of total connections, covering much of the Nanoose Bay Peninsula.
- **San Pareil** – established in 1999, the second largest system by number of connections, and located northeast of Parksville.
- **Surfside** – established in 1986 making it the longest managed system for RDN, located in the area north of Qualicum Beach.
- **Westurne Heights** – established in 2016 making it RDN's newest system, located two kilometers south of the Highway 4/Chatsworth Road intersection.
- **Whiskey Creek** – established in 2011, serving the Westerlea Estates subdivision located eight kilometers southwest of Qualicum Beach

Table 3: RDN's Water Service Areas

Water Service Area	Year Established	Water Source	Number of Connections
Decourcey	1998	Groundwater (1 well)	5
Englishman River	2003	Groundwater (well series)	151
French Creek	1980	Groundwater (well series)	238
Melrose Terrace	2005	Groundwater (1 well)	28
Nanoose Bay	2005	Groundwater supplemented from Englishman River	2205*
San Pareil	1999	Groundwater (well series)	288
Surfside	1986	Groundwater (2 wells)	39
Westurne Heights	2016	Groundwater (1 well)	17
Whiskey Creek	2011	Surface water (Crocker Creek)	125

* Nanoose Bay also has 64 commercial, institutional and multi-family residential connections

4.2 Water Production and Consumption

This summary of very recent water production trends builds on previous work covering earlier years. Consistent with that work, production is defined as "the total inputs of water that enters a WSA distribution system including groundwater and surface water" (McSorley, 2018b, p. 4). More details on this analysis can be found in Technical Memo #2 (Demand Analysis and Forecasting).

Per connection water production curves for the combined total of all nine WSAs are shown below in Figure 3. Values are shown in Table 4.

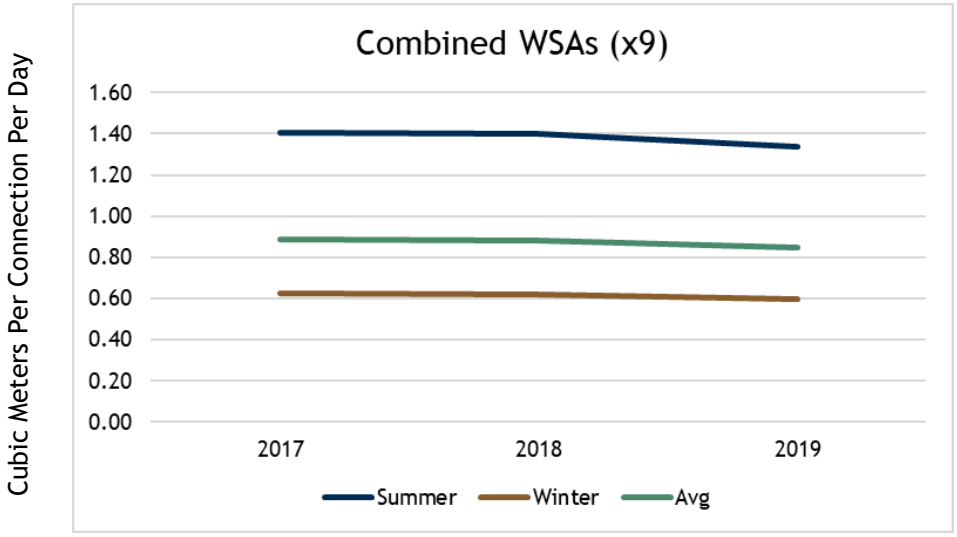

Figure 3: Per Connection Combined Water Production for All RDN WSAs, 2017 to 2019
* Includes commercial connections

No discernable trends can be detected in the production curves. This is expected when only looking at a few years of data, where structural trends in water use will be over-ridden by short term variation in seasonal weather. However, previous analysis (McSorley, 2018b; AquaVic 2013) does indicate consistent reductions in production and demand over time, which is not surprising given RDN's efforts through Team WaterSmart and trends across North America over the past decade.

Table 4: Per Connection Water Production for RDN Water Service Areas, 2017 to 2019

Water Service Area	Season	m^3/Connection/Day		
		2017	2018	2019
Decourcey	Summer	0.69	0.99	1.28
	Winter	0.29	0.34	0.31
	Average	0.43	0.56	0.64
Englishman River	Summer	2.16	2.33	2.26
	Winter	0.65	0.58	0.68
	Average	1.16	1.17	1.21
French Creek	Summer	1.08	1.04	1.07
	Winter	0.59	0.50	0.48
	Average	0.75	0.68	0.68
Melrose	Summer	0.69	0.52	0.59
	Winter	0.59	0.46	0.48
	Average	0.63	0.48	0.52
Nanoose Bay (Combined)	Summer	1.40	1.40	1.32
	Winter	0.59	0.62	0.57
	Average	0.86	0.89	0.82
San Pareil	Summer	1.56	1.49	1.44
	Winter	0.84	0.68	0.71
	Average	1.08	0.95	0.95
Surfside	Summer	1.23	1.48	1.42
	Winter	0.45	0.41	0.48
	Average	0.71	0.77	0.80
Westurne Heights	Summer	0.58	0.44	0.47
	Winter	0.40	0.41	0.34
	Average	0.46	0.42	0.38
Whiskey Creek	Summer	1.23	1.08	1.14
	Winter	0.86	0.85	0.98
	Average	0.99	0.93	1.03
Combined WSAs (x9)	Summer	1.41	1.40	1.34
	Winter	0.62	0.62	0.60
	Average	0.89	0.88	0.85

Peaking factors for both Nanoose Bay Peninsula and for the combined total of all nine WSAs can be found in Figure 4. As discussed in Technical Memo #2, note that peaking factor was calculated using the somewhat unorthodox formula set out in the figure.

Also consistent with previous analysis, both comparison of summer to base (winter) demand in Table 4 and looking at peaking in Figure 4 demonstrate that summer use in the WSAs tends to be high, without doubt driven by residential lawn and garden irrigation. This bolsters the case for continued demand management efforts targeting this end use.

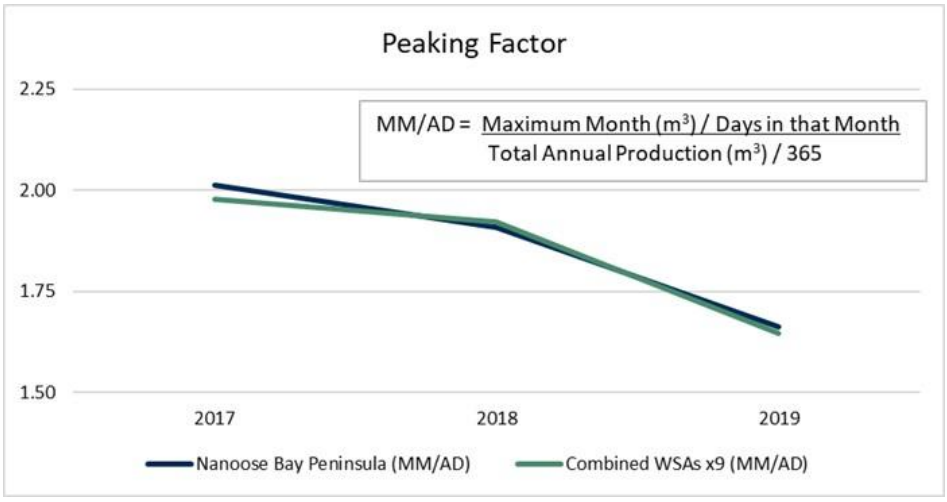

Figure 4: Peaking Factor in RDN's Nanoose Bay WSA and Combined WSAs, 2017 to 2019

In depth examination of metered residential customer consumption was not part of the scope of preparing this plan, as this was unnecessary because it was undertaken very recently under a separate project (see McSorley, 2018b). However, annual totals for the 2018/19 billing year are set out in Table 5.[1]

Table 5: Single Family Residential Metered Water Consumption, 2018/19 Billing Year

Water Service Area	2018/19 Total m^3	Connections	Liters/connection/day	Liters/capita/day
Decourcey	992	5	544	247
Englishman River	57,336	151	1040	473
French Creek	48,306	238	556	253
Melrose	4,082	28	399	182
Nanoose Bay	580,721	2205	722	328
San Pareil	71,632	288	681	310
Surfside	10,030	39	705	320
Westurne Heights	1,847	17	298	135
Whiskey Creek	27,561	125	604	275
Combined WSAs x9	**802,508**	**3,096**	**710**	**323**

[1] Liters per connection per day results in Table 5 are generally in line with findings in previous RDN analysis by (McSorley 2018b, p. 20). However, note that in three instances (Decourcey, Melrose and San Pariel) variation exceeds 30%. Resolving this was outside the scope of preparing this plan, but in the cases of Decourcey and Melrose, this could be explained by data skewing due to the very small size of these systems (e.g., just a few customers making changes to consumption, large leaks inside private properties, or meter errors can make a large difference in results). Note that no validation of this data was completed by Econics.

4.3 Commercial, Institutional and Multi-Family Residential Demand

Most consumption in the WSAs occurs in single family homes. However, there is a small group of commercial, institutional, multi-family residential, strata residential and other residential users. The breakdown of consumption by customer category can be found in Figure 5.

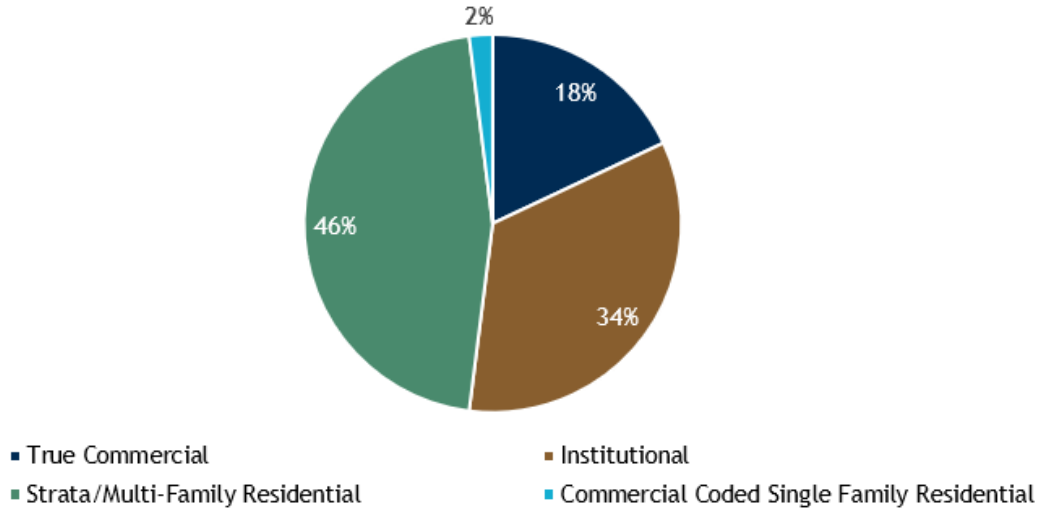

Figure 5: Commercial, Institutional and Multi-Family Residential Water Consumption, 2019 (n=66)

In total, there are 66 accounts in this group, 64 of which (and virtually all consumption) are located in Nanoose Bay Peninsula WSA. These accounts are held by an even small number of customer entities, 30 in total (i.e., some customers have multiple accounts).

New measures intended to help customer classes other than single family residential manage their water use are discussed further in Section 7.

4.4 Water Balance

Analysis of production and consumption trends yields the water balance set out in Figure 6 for the combined nine WSAs.[2]

[2] Note that water production totals used in the calculation of this water balance are slightly different than those discussed in Section 4.2, as production data used here are for the 2018/19 billing year as opposed to the 2019 calendar year in order to align with the single family residential consumption data in Table 5 (which also cover the 2018/19 billing year).

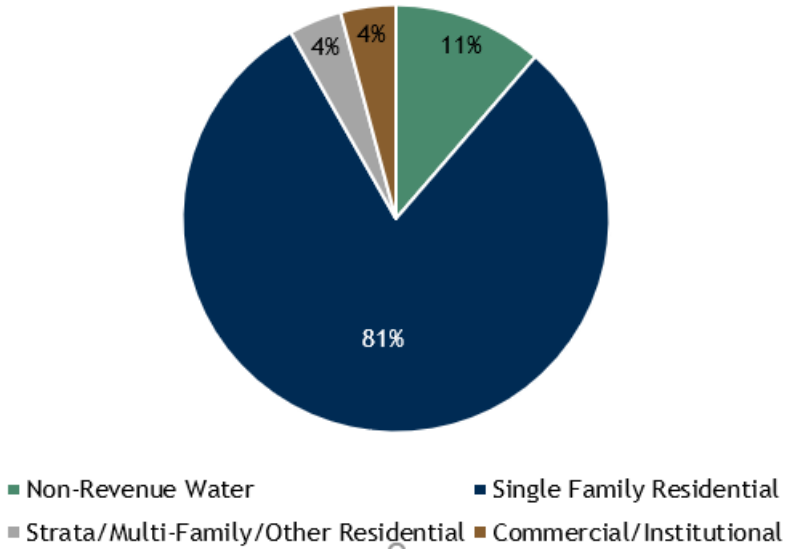

Figure 6: Estimated Water Balance for Combined RDN Water Service Areas, 2018/19

Note that there is some uncertainty around non-revenue water estimates. The analysis presented here yields an estimate of 11% of total production for 2018/19. However, other recent analysis has estimates that range from 2.4% in Surfside to as high as 44% in San Pareil (see RDN, 2020d). The estimated weighted average for these results is approximately 25%, noting that there are known operational explanations for some of this in some WSAs. Further analysis will be required to reconcile this gap. Section 7 discusses opportunities to improve water use accounting and improve management of non-revenue water as a key early priority of this plan.

5.0 Water Conservation Plan Objectives

Drinking Water and Watershed Protection Action Plan 2.0 Vision and Mission

Our vision is for healthy, safe, and resilient water resources in the region, enabled through strong partnerships.

Our mission is to provide regional leadership at the watershed scale to support water management, land-use planning, and community outreach and advance drinking water sustainability, climate adaptation, and healthy ecosystems.

Source: RDN, 2020b, p. 17

While the scope of this plan focuses narrowly on water conservation within the boundaries of RDN's WSAs, its objectives are nested within the broader vision and mission of the regional DWWP Action Plan (see Text Box).

The DWWP Action Plan 2.0 also articulates more specific goals and objectives that frame the conservation activities under this plan. These are listed in Table 6 below. Note that the second, third and fifth goals are all particularly relevant.

Table 6: Drinking Water and Watershed Protection Action Plan 2.0 Goals

1. Protect, manage and restore ecosystems and the overall health and functioning of our watersheds and aquifers.
2. Safeguard and manage source waters to secure a sustainable drinking water supply.
3. Increase water-use efficiency and optimize infrastructure investments for water and wastewater systems.
4. Foster the enjoyment and protection of social, cultural, and recreational values and amenities in our watersheds to maintain well-being and quality of life.
5. Mitigate and better prepare for climate change impacts on the region's water resources.

Source: RDN, 2020b, p. 18

In addition to these important linkages with the DWWP Action Plan 2.0, the following supplemental and supporting objectives pertain specifically to the plan in this document:

- continue to reduce per capita production and consumption in all WSAs year round;
- continue to reduce peak demand in the summer in order to better prepare for climate change impacts and improve resiliency to drought and other water shortages;
- focus resources to provide additional support to residents or WSAs with above average demand;
- improve understanding of non-revenue water and better manage system losses from leakage and other sources;
- support RDN's asset management program; and,
- foster a water stewardship ethic and ensure we collectively act as good neighbours to surrounding communities who share use of our aquifers and streams.

The vision, mission and goals of the DWWP Action Plan 2.0 and the additional supplemental objectives articulated above will continue to shape implementation over the decade to come.

6.0 Overview of Current Water Conservation Programs

The actions set out in the next section do not start from scratch. Rather, they build on years of work by RDN, partners and residents under the 2013 Water Conservation Plan and DWWP Program. This section provides a very brief inventory of current measures, many of which will continue under the updated plan. Readers wanting more information can consult Technical Memo #1 (Existing Program Review).

It is also important to note that RDN offers many other water-related programs and services not tied directly to conservation, such as Septic Smart rebates and subsidized well water quality testing (see, for example, www.rdn.bc.ca/wellsmart).

RDN's program is mainly delivered to residents across the region under the Team WaterSmart brand (see Figure 7) and have been for many years. This includes both education measures and incentives.

Figure 7: Team WaterSmart Wordmark

Relevant education measures include:

- **Community Events:** Team WaterSmart hosts staffed booths at a variety of community events across the region;
- **Youth Resources:** curriculum resources are readily available for teachers, complimented by Team WaterSmart classroom visits and watershed field trips for students in grades 4 and 5.
- **Print Resources and Online Tools:** RDN distributes guidebooks and brochures on topics such as lawn and garden best practices, with many additional resources available online at www.rdn.bc.ca/team-watersmart.

Relevant incentives Include:

- **Residential Irrigation System Check-Ups**: free home visits by qualified technicians that help residents operate their irrigation systems more efficiently.
- **Irrigation Upgrades and Soil Improvements Rebate**: rebates to help residents retrofit systems with more efficient components and improve soil structure and water retention capabilities.
- **Rainwater Harvesting Rebate:** Up to $750 in rebates are available to homeowners who install a system with 1,000 imperial gallons of storage or more.

RDN also coordinates regionally harmonized outdoor watering restrictions that specify days of the week and times that residents can irrigate lawns and gardens, staged to escalate requirements in the event of drought or other shortages.

In addition to these programs, RDN's Water Services Department helps residents manage their use by using a volume-based water services pricing structure. It also strives to ensure its own operations are efficient by promptly fixing leaks and addressing other sources of loss.

More information on these successful programs and how they will continue under this plan is provided in the next section.

7.0 2020 - 2030 Water Conservation Program

This section sets out the new and continuing measures RDN will implement over the next decade to attain the objectives set out in Section 5.

The new program places strong emphasis on helping residents becoming more efficient and positioning RDN to make better-informed decisions around water management in the future. In some cases, the measures are enhancements of tools that are already in place. In other cases, new programs will be developed and implemented.

The actions in this strategy are organized around five themes:

1. **Reduce Outdoor Water Use**: enhance effectiveness of existing incentives and regulations that help residents reduce outdoor irrigation of lawns and gardens.

2. **Implement a Commercial, Institutional and Multi-Family Residential Pilot Project:** help the small group of WSA customers that do not fall into the single family residential category control their consumption.

3. **Review Water Service Rates to Optimize Conservation-Orientation:** as part of a planned review aimed primarily at ensuring revenue sufficiency, review rates and the rate structure to ensure they provide incentives to conserve.

4. **Improve Water Use Accounting and Management of Non-Revenue Water:** Sequentially improve data on consumption and production, identify sources of non-revenue water including leakage, and implement appropriate measures to control losses.

5. **Continue Team WaterSmart Outreach Implementation:** raise awareness of the importance of water conservation, assist residents to reduce use indoors, continue outreach to youth, and foster a community stewardship ethic.

Elaboration is provided in the following pages.

7.1 Theme 1 - Reduce Outdoor Water Use

As discussed in Section 4, water use in the WSAs grows dramatically in the summer, typically more than doubling the base use in the winter. The great majority of this is due to residents irrigating lawns and gardens.

Residents enjoy working in their yards and the lifestyle benefits these green spaces provide. RDN will support them to continue to do so while also using our finite water resources in the most efficient way possible.

RDN will continue to implement and enhance the following current measures as a top priority under this updated plan:

- **Residential Irrigation System Check-Ups:** Team WaterSmart will continue to offer irrigation system check-ups. These will remain a free, voluntary, seasonal service. For those who cannot participate in check-ups, RDN will also continue to offer periodic workshops, hosted at community centres and through webinars online. More information on the program can be found at www.rdn.bc.ca/irrigation-initiatives.

- **Irrigation Upgrades and Soil Improvements Rebate:** Building on the irrigation check-ups, these rebates help residents retrofit systems with more efficient components and improve soil water retention capabilities. Up to $675 in rebates are available, and applicants who complete both irrigation upgrades and soil amendments may be eligible for a bonus of up to $100. More information can be found at www.rdn.bc.ca/irrigation-upgrades-and-soil-improvements.

- **Watering Restrictions:** regulatory approaches like watering restrictions are highly cost effective because they can make significant contributions to cutting demand without requiring large operational budgets (excepting enforcement costs). In 2015, RDN spearheaded implementation of a harmonized, region-wide restriction program after an unprecedented hot and dry summer. The schedule is divided into four stages (see Figure 8, note that Surfside and Decourcey WSAs have slightly different requirements). More detail can be found at www.rdn.bc.ca/watering-restriction-map.

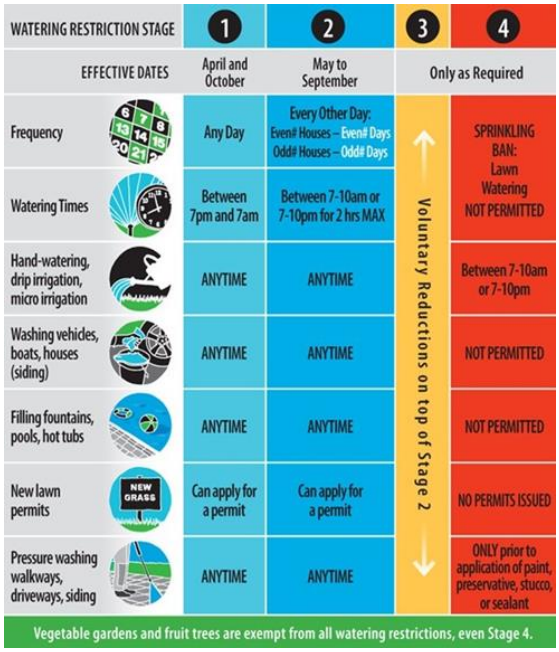

Figure 8: Regional Watering Restrictions Schedule

RDN will build on the success of these ongoing measures with the following enhancements:

- increase the number of irrigation system check ups taking place in WSAs by setting an annual target of at least fifteen (over the past decade, between five or ten of these typically happen per year in the WSAs);
- target check ups in WSAs with above average summer per connection use, particularly Englishman River;
- continuously improve how audits are done by building on international best practices and employing community based social marketing techniques (see, for example, McKenzie-Mohr, 2011);
- implement targeted and escalating enforcement of watering restrictions in WSAs and properties with known instances of repeat non-compliance;
- increase promotion of efficient outdoor use through increased Team WaterSmart outreach (see Theme #5, below).

Table 7 summarizes the core actions under this theme, expected outcomes and linkages to the plan objectives set out in Section 5.

Table 7: Theme #1 Summary

Theme 1: Reduce Outdoor Water Use		
1.1	Residential Irrigation System Check-Ups	Enhance
1.2	Irrigation Upgrades and Soil Improvements Rebate	Continuing
1.3	Outdoor Watering Restrictions	Continuing
Expected Outcome	Maintain maximum month average daily water production	
Links to Plan Objectives	• continue to reduce peak demand in the summer • focus resources to provide additional support to residents or WSAs with above average demand	

7.2 Theme 2 - Commercial, Institutional & Multi-Family Residential Pilot Project

As noted in Section 4.3, Nanoose Bay WSA has a small number of commercial, institutional and multi-family accounts (64 in total in Nanoose alone, held by only 30 unique customer entities). Altogether, they consume 8% of total water produced across all WSAs. Within, this group, most demand is concentrated in an even smaller number of accounts. The Top 10 highest volume customers (by entity, not account) make up 92% of all demand in these sectors; the Top 5 customers make up 79%.

See Technical Memo #2 (Demand Analysis and Forecasting) Section 3.0 for more information on demand in the commercial, institutional and multi-family residential sectors.

The limited amount of commercial and institutional use is tightly concentrated in a small number of locations and use types (primarily strip mall, golf course and marina), making it relatively simple to reach these customers with targeted advice.

There are also a number multi-family, bare land strata and mobile home accounts, some of which have quite high demand. RDN will work with strata councils and property managers to help these customers manage their consumption. This may include irrigation system check ups, targeted education, help with locating leaks on the customer side of the water meter, and potentially targeted incentives to replace inefficient fixtures indoors.

This theme has an important linkage with the DWWP Action Plan 2.0, which intends Team WaterSmart campaigns for new sectors including industrial, commercial and institutional (RDN, 2020b, p. 24). A successful pilot project in the WSAs can provide learnings that may inform development of a program that can later be rolled out region wide.

Table 8 summarizes the core actions under this theme, expected outcomes and linkages to the plan objectives set out in Section 5.

Table 8: Theme #2 Summary

Theme 2: Commercial, Institutional and Multi-Family Residential Pilot Project		
2.1	Commercial, Institutional and Multi-Family Pilot Project	New
Expected Outcome	Reduce per capita water demand	
Links to Plan Objectives	• continue to reduce per capita demand in all WSAs year round • continue to reduce peak demand in the summer • foster a water stewardship ethic	

7.3 Theme 3 - Review Water Service Rates to Optimize Conservation-Orientation

While the primary purpose of water rates is to ensure that there is sufficient revenue to fund continued operation of the water systems, effective volume-based pricing is a financial tool that can be used to encourage conservation. When rates are structured so that customers pay more if they use more, they will have an incentive to do so wisely and to purchase efficient fixtures and appliances for their homes and businesses.

RDN has one water user fee rate structure for all WSAs. The structure is designed with fees increasing as customers exceed established volumetric thresholds (a 'tiered' or 'inclining block' structure). Customers pay a minimum daily rate of $0.35 and then charges at different prices as consumption thresholds are passed. Table 9 shows current rates.[3]

Table 9: Regional District of Nanaimo Residential Water Service Rates

Rate per Cubic Meter per Day						
Minimum Daily Rate	**Up to 0.7**	**0.71 to 1.4**	**1.41 to 2.1**	**2.11 to 2.8**	**2.81 to 3.5**	**Over 3.51**
$0.35	$1.08	$1.23	$1.58	$1.86	$2.50	$3.75

* Displayed water and wastewater charge assumes non-discounted residential consumption rates, paid on or before bill due date, and does not include any additional surcharges or parcel taxes. See https://www.rdn.bc.ca/water-user-rates.

RDN plans to conduct a review of water rates fees and charges during the period of this plan. The primary goal of this review is to ensure that revenue is stable and sufficient enough to cover the long-term costs of running systems. However, it will also consider other objectives including affordability, fairness, and communication simplicity. The scope will also explore whether rates and the rate structure can be further optimized to encourage conservation. For example, this may include:

- shifting more of the total revenue collected from fixed charges to the volumetric portion of the rate structure, including revenue currently collected through parcel taxes;
- making the rate structure simpler by reducing the number of tiers so residents can easily understand it and better respond to the conservation price signal;
- increasing the per unit charge at the highest tiers so residents who consume lots of water (and therefore impose higher costs on the system) pay their fair share;
- consider introduction of seasonal surcharges designed to reduce summer demand.[4]

The review will follow industry best practices, including the procedures and principles set out the American Water Works Association Manual M1, Principles of Water Rates, Fees, and Charges (AWWA, 2017).

[3] In addition, properties are charged annual parcel taxes which are used to offset capital costs. These vary from one WSA to another. However, because these charges do not vary for any particular property based on the volume it consumes, the parcel taxes are not likely to significantly influence consumption decisions.

[4] See AWWA (2017) Chapter IV.5 for more information on seasonal surcharges.

Table 10 summarizes the core actions under this theme, expected outcomes and linkages to the plan objectives set out in Section 5.

Table 10: Theme #3 Summary

Theme 3: Review Water Service Rates to Optimize Conservation-Orientation		
3.1	Water service rate review	Enhance
Expected Outcome	Reduce per capita water demand	
Links to Plan Objectives	• continue to reduce per capita demand in all WSAs year round • continue to reduce peak demand in the summer • foster a water stewardship ethic	

7.4 Theme 4 - Improve Water Use Accounting & Non-Revenue Water Management

Managing non-revenue water, including system losses through leaks, is often one of the most effective and low cost ways to conserve. There are many components of non-revenue water. Some are legitimate uses, such as main flushing and fire hydrant testing. Others are sources of waste, such as easily repairable leaks and overflows. The Region strives to operate its WSAs as efficiently as possible and will invest greater effort in this over the next decade. This approach has the added benefit that, when implemented carefully, it requires no behavior change by residents and has little or no impact on people's lifestyles.

Most efforts on water loss in recent years have focused on reactive response to main breaks and leaks that surface above ground. However, there is increasing awareness within RDN of opportunities to improve non-revenue water management.

As noted above in Section 4.4, there is currently some uncertainty about current levels of non-revenue water and system losses. As a result, the first task under this theme will be to improve water use accounting and conduct a formal water audit following the procedures set out in American Water Works Association Manual of Water Supply Practices M36 (Water Audits and Loss Control Programs). This may involve conducting night flow analysis, adding additional system metering, or other system enhancements as required.[5]

Concurrently, the Region will also tighten water production and use data management. It will standardize and document tracking and reporting methods in the Water Services procedures manual. Technical Memo #2 (Demand Analysis and Forecasting, p. 32) provides preliminary guidance on required steps.

Based on results of the water audit and data management improvements, the Region will implement standard industry best practices for managing system loss as appropriate. As a starting point, these efforts will be targeted as WSAs with higher reported non-revenue water figures (i.e., San Pareil, Whiskey Creek, Nanoose Bay and Melrose Terrace).

Results of the water audit will also be used to establish measurable loss reduction targets for the next decade. See Section 8, below, for more on targets under this plan.

Looking to the future, RDN may also pilot pressure management and other more advanced system loss management techniques, both to reduce real losses in RDN WSAs and to develop learning and experience for the benefit of other service providers in the region.

Table 11 summarizes the core actions under this theme, expected outcomes and linkages to the plan objectives set out in Section 5.

[5] See AWWA (2016) Chapter 7 for further guidance on procedures and issues for water use accounting and non-revenue water management for small systems.

Table 11: Theme #4 Summary

Theme 4: Improve Water Use Accounting and Management of Non-Revenue Water		
4.1	Water use accounting and water auditing	Enhance
4.2	Non-revenue management water and reduced system losses	Enhance
Expected Outcome	• Reduce system losses	
Links to Plan Objectives	• continue to reduce per capita production and demand in all WSAs year round • improve understanding of non-revenue water and management of system losses	

7.5 Theme 5 - Continue Team WaterSmart Outreach Implementation

- **Community Events** - Team WaterSmart hosts a variety of staffed booths across the region at fairs, festivals and environmental stewardship events (see Figure 9). Booths typically utilize educational visuals and information display boards, often including giveaways such as native plants. These events provide opportunities for staff to reach many people quickly to promote programs. Opportunities to host events in the WSAs are limited, but residents can still participate when they take place in nearby communities.[6]

Figure 9: Team WaterSmart Booths at Community

- **Publications and Online Resources** - Team WaterSmart publishes a series of guidebooks and brochures on topics such as lawn and garden best practice including irrigation system management. They are attractively designed and include thorough detail for residents who are interested in applying water conservation techniques and strategies both outdoors and indoors (see Figure 10). There are also a host of resources available online.

Figure 10: Team WaterSmart Brochures

[6] Note that in 2019, Team WaterSmart hosted a 'Meet Your Neighbours' event in the Rivers Edge subdivision of the Englishman River WSA.

- **Youth Resources:** RDN delivers curriculum resources for teachers in the region that aim to engage students in ongoing learning about water sustainability, complimented by Team WaterSmart classroom visits. Field trips are also offered to students in grades 4 and 5 to the Englishman and Nanaimo River watersheds. Additional youth resources are available online.

- **Rainwater Harvesting Rebate**: Up to $750 in rebates are available to homeowners who install a rainwater collection system with 1,000 imperial gallons of storage or more. Since the program began in 2011, 15 rebates have been issued in the WSAs, averaging 1.7 per year. About half of these have been issued in Nanoose. More information can be found at www.rdn.bc.ca/rainwater-harvesting.

RDN will build on the success of these ongoing measures with the following enhancements:

- ensure that Team WaterSmart events occur regularly either within WSAs or within a short drive;
- continue to push Team WaterSmart best practice guidance into the WSA communities through events, direct mail, social media and other online channels;
- ensure that Nanoose Bay Elementary School students receive their share of water conservation youth outreach proportional to the rest of the region;
- continue to offer and promote rainwater harvesting rebates to WSA residents;
- continue to build a water stewardship ethic in the WSA communities; promote awareness of the DWWP Program and its vision, mission and goals.

Table 12 summarizes the core actions under this theme, expected outcomes and linkages to the plan objectives set out in Section 5.

Table 12: Theme #5 Summary

Theme 5: Continue Team WaterSmart Outreach Implementation		
5.1	Team WaterSmart publications, events and online resources	Continuing
5.2	Team WaterSmart youth outreach	Continuing
5.3	Rainwater harvesting rebate	Continuing
Expected Outcome	Reduce per capita demand	
Links to Plan Objectives	• reduce per capita production and consumption in all WSAs year round • continue to reduce peak demand in the summer • foster a water stewardship ethic	

8.0 Implementation

This section describes how the water conservation program will be implemented. It also provides a framework for monitoring, evaluation and continuous improvement.

Table 13 provides a summary of the program measures, their current status, and the sectors they target.

Table 13: 2020-2030 Water Conservation Plan Program Summary

Theme	Code	Measure	Status	Sector
#1 Reduce Outdoor Water Use	1.1	Residential irrigation system check-ups	Enhance	Residential
	1.2	Irrigation upgrades and soil improvements rebate	Continuing	Residential
	1.3	Outdoor watering restrictions	Continuing	All
#2 Commercial, Institutional and Multi-Family Residential Pilot Project	2.1	Commercial, institutional and multi-family pilot project	New	Commercial, Institutional and Multi-Family
#3 Review Water Service Rates	3.1	Water service rate review	Enhance	All
#4 Improve Water Use Accounting and Management of Non-Revenue Water	4.1	Water use accounting improvement and water audit	Enhance	Water Utility
	4.2	Non-revenue management water and reduced system losses	Enhance	Water Utility
#5 Continue Team WaterSmart Outreach Implementation	5.1	Team WaterSmart publications, events and online resources	Continuing	Residential
	5.2	Team WaterSmart youth outreach	Continuing	Residential
	5.3	Rainwater harvesting rebate	Continuing	Residential

8.1 Water Conservation Plan Targets

RDN will pursue realistic water production and use targets to measure success towards implementation of this plan.

Target 1: Residential Consumption

For the residential sector, RDN aims to reduce consumption by 1.5% each year for the next ten years. Much of this will occur naturally as people replace inefficient fixtures and appliances over time. The remainder will be driven by this plan. As such, RDN's targets for the WSAs (as shown in Figure 11) are:

- Reduce single family residential consumption by 15% to 275 liters per capita (LCD) by 2030, benchmarked against 323 LCD in 2018/19.

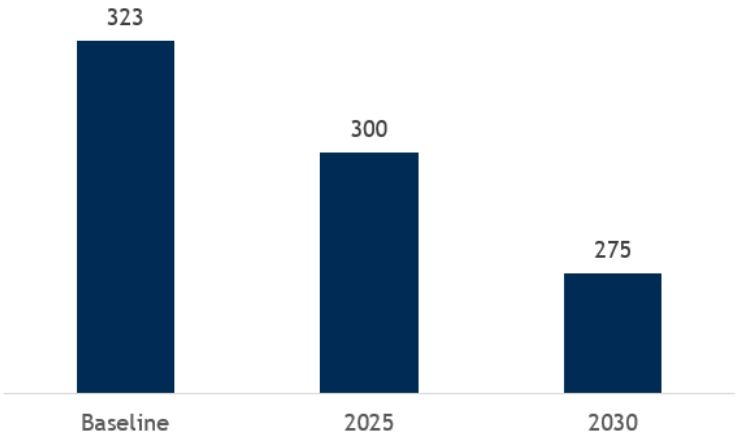

Figure 11: RDN WSA Single Family Residential Water Use Targets (Liters/Capita/Day)

Target 2: Peak Season Demand

With respect to peak demand, the target for the 2020 to 2030 operational period is aligned with the one set in the 2013 plan (AquaVic, 2013, p. 23) and aims to manage the amount of water withdrawn from streams and aquifers during the summer. Over the past five years, average production per day during the highest use month has consistently remained below 5,500 cubic meters per day (m^3/day) with an average of about 4,800 m^3/day. This is well below the 2013 target of keeping production below the 2004 level, which was about 6,270 m^3/day

Maximum month production is highly variable and heavily influenced by summer weather conditions. As well, summers are expected to become drier over the coming years. It will be challenging for RDN to reduce this figure by much going forward, notwithstanding the effort that will go towards helping residents reduce outdoor use under this plan. In light of this, the target for the next operational period is set to align with recent trends, as follows:

- Maintain maximum month average day total water production at or below 5,300 m^3/day, benchmarked against the July 2018 daily average.[7]

Target 3: Non-Revenue Water

As discussed in Section 5 (Theme #4), improving management of non-revenue water and system loss is a priority under this plan; however, there remains some uncertainty about the current situation. This will be investigated as an early implementation priority. Once these investigations have been completed and uncertainty has been narrowed, the Region will set quantified targets in this area. These will be expressed as a target reduction of non-revenue water as a percentage of total production across all WSA. Alternatively, it may be possible to express this as an infrastructure leakage index (ILI) target based on the American Water Works Association methodology.[8]

[7] Note that this is measured as the highest total combined (all WSAs) water production month in a billing year divided by number of days in that month, expressed in cubic meters per day (m^3/day).
[8] It is noted that there are limitations to the use of the ILI metric for small systems. However, it may be possible to develop a reliable ILI specifically for Nanoose Bay Peninsula WSA. AWWA (2016), Chapter 7 provides further guidance on this issue.

8.2 Monitoring and Evaluation

Indicators from each program theme are compiled in Table 14. These are intended to support the strategic targets set out above. Performance will primarily be measured through staff tracking.

Table 14: Program Indicators and Metrics

Theme	Indicators	Metrics
#1: Reduce Outdoor Water Use	Peak season demand	Maximum month production
	Compliance with the watering bylaw	Number of watering bylaw warnings issued
	Irrigation Check Up Uptake	Check ups in WSAs per year
	Irrigation and soil rebates	Rebates in WSAs per year
#2: Commercial, Institutional and Multi-Family Residential Pilot Project	Site audits or visits completed	Number of facilities audited
	Reduced water use in target sectors	Percent change in average non-single family residential metered consumption
#3: Review Water Service Rates	Review completed	Board approves new rates and/or rate structure post review
#4 - Improve Water Use Accounting and Management of Non-Revenue Water	Water audit completed	Result approved by RDN senior management
	Volume of water losses (real and apparent)	m^3/service connection/year
	Volume of non-revenue water	Percent of total system production
#5 - Continue Team WaterSmart Outreach Implementation	Per capita demand	Percent change in single family residential per capita consumption (LCD)
	Event delivery	Number of events delivered within 10 minute drive of a WSA annually
	Rainwater harvesting rebate uptake	Number of rebates issued in WSAs per year

8.3 Implementation Schedule

A summary schedule for implementation is outlined in Table 15 on the next page. This may be modified as requirements are more clearly defined.

Early implementation priorities include the following:

- complete a water audit commencing in 2020 to improve understanding of non-revenue water and sources of loss;
- based on water audit results, develop and commence implementation of an ongoing system loss management program in 2020/21;
- in 2021, identify and implement enhancements to the irrigation system check up program;
- in 2022, conduct a water services rate review that includes investigation of conservation-oriented pricing in its scope; and,
- in 2023, design and implement the commercial, institutional and multi-family residential pilot project.

Table 15: Water Conservation Plan Implementation Schedule

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
#1: Reduce Outdoor Water Use											
Residential irrigation system check-ups											
Irrigation upgrades and soil improvements rebate											
Outdoor watering restrictions											
#2: Implement Commercial, Institutional and Multi-Family Residential Pilot Project											
Commercial, institutional and multi-family pilot project											
#3: Review Water Service Rates											
Water service rate review											
#4: Improve Water Use Accounting and Management of Non-Revenue Water											
Water use accounting improvement and water audit											
Non-revenue management water and reduced system losses											
#5 Continue Team WaterSmart Outreach Implementation											
Team WaterSmart publications, events and online resources											
Team WaterSmart youth outreach											
Rainwater harvesting rebate											

Legend	
	Implementation commencement
	Ongoing continuation

8.4 Adaptive Management

Consistent with the path set out in the DWWP Action Plan 2.0, implementation will follow an adaptive management framework. This means learning from experience and responding as needed to fine-tune delivery in response to feedback and outcomes (RDN, 2020b, p. 46). Progress towards targets set out in Section 8.1 and objectives in Section 5 will guide this. The formal date for updating the plan is 2030, but it may be reviewed before then if appropriate.

Plan implementation will be led by RDN's Water Services Department. Regular progress reports will be provided to the RDN Board. Staff may also periodically seek advice from WSA residents, the DWWP Technical Advisory Committee, and other stakeholders as appropriate.

9.0 Conclusion

This document sets out RDN's Water Conservation Plan for its Water Service Areas for the period from 2020 to 2030. By continuing to encourage efficient use, this plan will play an integral role in making WSA communities more sustainable. It will help us adapt to future pressures from climate change and provide a range of other social, ecological and financial benefits. It will also support ongoing pursuit of the DWWP Action Plan 2.0's vision for healthy, safe and resilient water resources in the region, enabled through strong partnerships.

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10.1 Resources

The following list provides various resources from leading jurisdictions, non-governmental organizations and other agencies that may assist with implementation of the themes and measures in this plan.

Theme 1: Reduce Outdoor Water Use

Water Smart Irrigation Professionals (York and Peel Regions and Landscape Ontario)
https://www.watersmartirrigationprofessional.ca/

Fusion Landscape Professional (York and Peel Regions and Landscape Ontario)
https://www.fusionlandscapeprofessional.ca/

Sustainable Landscapes: A Utility Program Guide (Alliance for Water Efficiency)
https://www.allianceforwaterefficiency.org/impact/our-work/sustainable-landscapes-utility-program-guide (note this is a "members only" benefit)

Theme 2: Commercial, Institutional & Multi-Family Residential Pilot Project

Canadian Best Practice Jurisdictions

York Region, Ontario
https://tinyurl.com/y8m5gxmn
Region of Peel, Ontario
https://www.peelregion.ca/watersmartpeel/businesses/indoorwater.htm
Waterloo Region, Ontario
https://www.regionofwaterloo.ca/en/doing-business/water-programs-and-funding.aspx
City of Guelph, Ontario
https://guelph.ca/living/environment/water/rebates/watersmartbusiness/

Seneviratne, M. (2007). A Practical Approach to Water Conservation at Commercial and Industrial Facilities. ISBN: 9781856174893

Resource Library (Alliance for Water Efficiency)

Theme 3: Review Water Service Rates to Optimize Conservation-Orientation

AWWA (2017). M1 Principles of Water Rates, Fees and Charges, 7th Edition. ISBN 9781625761910.

Financing Sustainable Water (Alliance for Water Efficiency)
https://www.financingsustainablewater.org/

Brandes, Renzetti and Stinchcombe (2010). Worth Every Penny: A Primer on Conservation-Oriented Water Pricing. Prepared for the POLIS Water Sustainability Project https://poliswaterproject.org/polis-research-publication/worth-every-penny-primer-conservation-oriented-water-pricing/

Waterworth Blog
https://waterworth.net/blog/

Value of Water Campaign
http://thevalueofwater.org/

Water Research Foundation (2016). Rate Approval Process Communication Strategy and Toolkit.
https://icma.org/sites/default/files/308295_Rate%20Approval%20Process%20Comm%20Strategy%20Toolkit.pdf

Theme 4: Improve Water Use Accounting & Non-Revenue Water Management

AWWA (2016). M36 Water Audits and Loss Control Programs, Fourth Edition. ISBN 9781625761002

AWWA Water Audit Software and Other Resources
https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control