

Climate-Informed Water Supply Planning and Communication Approaches in the Regional District of Nanaimo

Appendix 2: Municipal Water Service Provider Supply Profiles

October 2023

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Water Supply Planning in the Context of Climate Change in the Regional District of Nanaimo District of Lantzville



Image: District of Lantzville

District of Lantzville Population: 3,817 (2021 Statistics Canada, 2022)

Water Source(s): Groundwater via six wells (five on the Harby Road Wellfield and one in the foothills; Aquifers 215 and 213) and from the Nanaimo River via City of Nanaimo

District of Lantzville manages and governs its own water supply. Information in this profile was provided primarily by District staff in June 2022, supplemented with information from publicly accessible sources (see references). Information on aquifer status is sourced from the Provincial Government Groundwater Wells and Aquifers database or from reports commissioned by the Drinking Water and Watershed Protection Program within the past decade.

Supply

District of Lantzville's main supply source is groundwater from six wells. Five wells draw from semi-confined Aquifer 215 (see Province of BC, nd). One more well draws from an adjacent bedrock aquifer (Aquifer 213). Construction of two more wells is planned for the near future.

In addition to wells, Lantzville has a Water Agreement with City of Nanaimo that went into effect in 2018. This provides for a total allotment, if needed, of an additional 1,360 cubic meters per day from City of Nanaimo's surface water sources (District of Lantzville, 2018). This additional source provides additional capacity for expansion of the current water system to existing areas within the District that are not currently serviced. It also provides an emergency backup if the District's well field loses capacity or is contaminated.

However, large new developments must continue to find their own source of water to connect to the municipal supply. Typically, this will involve adding additional wells sourced from the same aquifers (Aquifer 215 and 213) but sited at different elevations to avoid interference issues.

The District has three reservoirs: one at Ware Road, one at Harwood Drive, and another within the Foothills (District of Lantzville, 2019).

Aquifer Status

The following table shows the status of the two aquifers that Lantzville draws from. Aquifer productivity rating is sourced from the Provincial Government groundwater wells and aquifers database (see Province of BC, nd). Groundwater level trend is sourced from DWWP Program Regional Groundwater Level Analyses (see RDN, 2023).

Aquifer No.	Aquifer Type	Water Region	Region Code	# of Active Obs Wells (BC & RDN)	Provincial Productivity Rating*	Groundwater Level Trend (2013-2023) **
213	Bedrock	South Wellington to Nanoose	WR5	3	Moderate	Increasing
215	Sand & Gravel			3	Moderate	Stable to moderate decline (2 obs wells stable; 1 obs well moderate decline)

* Source: [Province of BC \(nd\)](#)

** Source: [RDN \(2023\)](#)

On the whole, results indicate that at least part of Lantzville’s primary aquifer (Aquifer 215) is experiencing moderate to high stress, exacerbated by its small catchment area, limited recharge potential, and high density of wells (see Province of BC, nd; GW Solutions, 2017a). Aquifer 213 may experience localized stress, but this is not reflected in the aquifer-wide water budget assessment (see Waterline, 2013; GW Solutions, 2017b). Note, however, that pressure on these sources has been relieved to some extent by the addition of surface water supply from City of Nanaimo.

Demand Forecasting

Demand forecasting was undertaken as part of a 2015 Water Supply and Distribution System Study, discussed further below. This predicted significant population growth to 5,700 people by 2065. It noted the potential impacts of climate change on demand but did not quantitatively model this. The 2015 forecasts are reviewed informally by staff annually (i.e., staff review up-to-date demand trends), and a full update is planned for 2024. The scope of work will require modelling for potential impacts of climate change (e.g., potential increases in demand for irrigation).

Water Supply Planning

Water Supply Master Planning

As noted above, a Water Supply and Distribution System Study was completed by consulting engineers in 2015 (see Koers and Associates, 2015). This informed completion of a Lantzville Water Master Plan in 2017, which included consideration of the potential impacts of climate change. It also recommended “identification of a new water source for Lantzville to allow continued extension of the water system to existing residents and prepare for potential future demands” (District of Lantzville, 2017). The identified need for additional source ultimately led to the water agreement with the City of Nanaimo.

Since completion of that study, significant changes have included addition of supply from City of Nanaimo and continued reductions in per capita demand. As a result, an update to the Master Plan is scheduled for 2024. This will examine potential impacts of long-term climate forecasts and changes to aquifers. Staff predict that it will recommend increasing reservoir

capacity to meet short term, seasonal spikes in demand expected because of warmer weather.

Drought Response

Lantzville follows the regional watering restrictions framework (see RDN, 2022). One of the conditions of the Water Agreement is that the District must maintain the same level of restrictions as the City of Nanaimo, although it can go to higher restriction levels if required. There is no formal drought management plan for this water system.

Demand Management

Lantzville has a water conservation plan, prepared as a requirement for Provincial Government grant funding application process.

All connections in the District are metered and pay based on the volume consumed. The District also participates in the RDN's Team WaterSmart program (educational resources, rebates) and promotes it to residents.

System loss management is dealt with on an opportunistic basis rather than through an active leak detection and response program. Losses to leakage are believed to be quite low given the relative newness of the distribution system.

Emergency Response

District of Lantzville has an emergency water supply plan that sets out procedures in the event of supply failure or other short-term crises.

Communication with Residents

Communication about supply occurs mainly through the District of Lantzville website. Most content is static, but the site includes links to key content such as the Water Master Plan and RDN Team WaterSmart resources. There is also a monthly newsletter that water services staff can provide content to on an "as needed" basis.

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Water Supply Planning in the Context of Climate Change in Regional District of Nanaimo City of Nanaimo



Image: [Wikipedia](#)

City of Nanaimo Population: 99,863 (2021 Statistics Canada, 2022)

Water Source(s): South Fork of Nanaimo River via Jump Lake and South Fork Lake Reservoirs

City of Nanaimo manages and governs its own water supply. Information in this profile was provided primarily by City staff in June 2022, supplemented with information from publicly accessible sources (see references section).

Supply

City of Nanaimo's supply comes from two storage lakes on the Nanaimo River. South Fork Lake Dam was constructed in 1930/31 at 30 metres in height and 2 million cubic metres full capacity. Jump Creek Dam was constructed above South Fork in the early 1970's for a total of 17 million cubic metres of storage (City of Nanaimo, 2018).

Stored water from the dams supports both the community's water requirements and provides additional environmental flows into the Nanaimo River for rearing salmon.

The watershed of the South Fork of the Nanaimo River, located 20 kilometres southwest of the City, covers 230 square kilometres. The City owns the footprint of its two dams, out to the outline of the high-water mark of the two reservoirs, plus a small buffer. Since the watershed itself is privately owned, an agreement between the City and Mosaic Forest Management Corporation is in place to protect the water source and quality (City of Nanaimo, 2020a).

The majority of the City's water supply system is conveyed by gravity from the watershed through the South Fork Water Treatment Plant. Nine balancing reservoirs are located throughout the city to meet peak domestic demand and emergency fire flows.

At this time, there are no plans to expand either surface or groundwater supply capacity. Current modelling, which includes assumptions about climate change impacts and maintaining ecological flows, indicates that supply is sufficient for 20 to 40 years (to a 2061 planning horizon).

Aquifers located in the area around the Nanaimo airport (aquifers 160, 161 and/or 964) may be available as a secondary source in the more distant future, as is the potential for aquifer storage and recovery. This option may be required to balance demand in the summer as

population grows. However, this remains purely conceptual, and no hydrological analysis has yet been undertaken. For information on the status of these aquifers, see Province of BC (nd) or Barosso, Ormond and Lapcevic (2015).

The City has separate agreements in place to provide bulk water to both District of Lantzville and Snuneymuxw First Nation, and supplies are sufficient to continue to do so for the foreseeable future.

Demand Forecasting

Demand forecasts have recently been reviewed as part of Nanaimo’s updated Water Supply Strategy, discussed further below. Projections are based on population growth forecasts from the City’s Official Community Plan and include scenarios with different assumptions about climate change and impacts of water use efficiency (e.g., efficient appliances and fixtures, system loss management, watering restrictions, etc.). The new Strategy speaks directly to climate change impacts and makes recommendations to address this, including demand management through watering restrictions. The City targets a relatively conservative 5% decrease in residential per capita demand per decade.

Water Supply Planning

Water Supply Master Planning

The City commenced a Water Supply Strategy update in 2020 (see City of Nanaimo, 2020b). Work is led by Kerr Wood Leidal, completed in 2022 (KWL, 2022). This updates the previous master plan, completed in 2007 (Associated Engineering, 2007). The 2007 plan called for construction of a new dam by 2022. However, the more recent planning confirms that this can be deferred for decades due to decreases in per capita demand and other factors.

The Water Supply Strategy update supports the recently completed “Reimagine Nanaimo” Plan. This integrates the Official Community Plan; Parks, Recreation, and Culture Plan; Transportation Plan; Active Mobility Plan; Climate Action and Resiliency Plan; and Accessibility and Inclusion Plan (City of Nanaimo, 2022a).

Drought Response

City of Nanaimo has demand curves for dam management that dictate when to escalate watering restriction levels in order to maintain ecological flows on the Nanaimo River. The City follows the regional watering restrictions framework (see RDN, 2022).

Demand Management

The City last prepared a water conservation plan in 2014 (see Aquavic, 2014). There are no plans to update this given that much of City of Nanaimo's demand management effort is outsourced to RDN through the Team WaterSmart program.

The City is fully metered, and residents are charged for water services based on the volumes they consume under a tiered rate structure (see City of Nanaimo, 2022b).

System loss and non-revenue water are managed on an opportunistic basis rather than through an active leak detection and response program. Third party analysis indicates that the City's Infrastructure Leakage Index is already quite low, and well within the Economic Level of Leakage. This means that more effort in this loss reduction would not likely be economically beneficial. However, City staff plan to review these findings again in 2024.

Emergency Response

The City has a Water Emergency Response Plan, last updated in 2017 and reviewed regularly (City of Nanaimo, 2017). This sets out procedures in the event of disruptions in water quality and delivery from emergencies such as natural disasters, accidents, or intentional acts, including the unlikely possibility of dam failure. City of Nanaimo has a reciprocal agreement with Harmac Pacific to share supply in the event of a short-term supply emergency (e.g., a natural catastrophe such as an earthquake).

Communication with Residents

Communication about supply occurs mainly through the City of Nanaimo website, which includes dedicated but static pages on water supply and treatment (City of Nanaimo, 2018) and watershed protection (City of Nanaimo, 2020a). City staff plan to provide additional information about the soon-to-be-completed Water Supply Strategy Update through a communications plan, subject to staffing capacity.

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Water Supply Planning in Context of Climate Change in the Regional District of Nanaimo City of Parksville



Image: [City of Parksville](#)

City of Parksville Population: 13,642 (2021 Statistics Canada, 2022)

Water Source(s): Groundwater wells (Aquifer 216) and surface water from Englishman River via Arrowsmith Dam and contributory sources.

City of Parksville manages and governs its own water supply. Information in this profile was provided primarily by City staff in June 2022, supplemented with information from publicly accessible sources (see references section). Information on aquifer status is sourced from the Provincial Government Groundwater Wells and Aquifers database or from reports commissioned by the Drinking Water and Watershed Protection Program within the past decade.

Supply

City of Parksville's water supply comes from two sources: groundwater and surface water. The groundwater wells are situated along the southwest boundary of the City. The City has 16 wells that draw from Aquifer 216. Well depth ranges from 22m to 38m.

The surface water comes from the Englishman River via Arrowsmith Dam and contributory sources. This is facilitated through the Arrowsmith Water Services (AWS) and Englishman River Water Service (ERWS) joint ventures.¹

Arrowsmith Dam is located 35 km south of Parksville. It has a volume of 9 million cubic meters of water. Releases from the dam supplement stream flows during summer and fall for water supply, to promote fish migration, and to support river ecology in the downstream reach of the Englishman River. Releases are based on a regulated Provisional Operating Rule set by Provincial Government and Fisheries and Oceans Canada. Depending on climactic conditions and seasonal requirements, conditions of the licence are adjusted in consultation with federal and provincial fishery authorities. At certain periods, flow requirements may be reduced to ensure sufficient water is retained in the reservoir for release during September and October (Parksville, 2022b).

¹ For more information on the ownership, governance, operations, and maintenance arrangements for the Englishman River Water Service and Arrowsmith Water Service joint venturers, see Englishman River Water Service (2021).

Since commissioning of the ERWS Water Treatment Plant, surface water from the river is utilized more through wet weather months than in the past. As less water is drawn from the groundwater source, wells show signs of recovery and previously declining water level trends in Aquifer 216 have now changed trajectory into increasing trends.

Aquifer Status

The following table shows the status of the Aquifers 216 and 220 (the former is a supply source for Parksville, the latter interacts hydraulically with the Englishman River watershed). Aquifer productivity rating is sourced from the Provincial Government groundwater wells and aquifers database (see Province of BC, nd). Groundwater level trend is sourced from DWWP Program Regional Groundwater Level Analyses (see RDN, 2023). Current dry season Stress level Dry season stress level is sourced from the DWWP Program Phase 3 Water Budget project (WSP Golder, 2023), noting that this is a regional level analysis of stress rating and that results from local well field analysis may differ.

Aquifer No.	Aquifer Type	Water Region	Region Code	# of Active Obs Wells (BC & RDN)	Provincial Productivity Rating*	Groundwater Level Trend (2023) **	Current Dry Season Stress Level***
216	Sand & Gravel	Englishman River	WR4	6	Moderate	Increasing	Very High
220	Bedrock			2	Low	Large decline to increasing: (1 obs well increasing; 1 obs well large decline)	Moderate

* Source: [Province of BC \(nd\)](#)

** Source: [RDN \(2023\)](#)

*** Source: WSP Golder (2023)

Demand Forecasting

Parksville’s last water supply study was completed in 2011. Forecasts in that plan made explicit, quantified assumptions about both continued water use efficiency and the potential impacts of climate change on demand. Modelling assumed a reasonably achievable water use reduction but still planned for unknowns related to climate change and infrastructure aging. This resulted in assumed usage 9% higher than status quo, providing a safety factor for future unknowns (see Associated Engineering et al, 2011, p. 2-5).

As discussed further in the next section, a Water Use Planning and Management Study will be completed in 2023/2024 to review the previous planning and assumptions, including demand forecasting.

Water Supply Planning

Water Supply Master Planning

As noted above, the last water supply planning process was completed in 2011. The summary report included six recommendations, including the need for Arrowsmith Water Service partners to confirm timing and quantity of bulk water supply from Arrowsmith Dam and to conduct feasibility testing for aquifer storage and recovery as a new approach to overall water resource management. The planning horizon for the 2011 master plan was 2050 (see Associated Engineering et al, 2011).

Further engineering planning took place around 2014 with development of more detailed engineering plans for the ERWS.

The City, through the ERWS, plans to update supply plans starting in 2023/24 under a new Water Use Planning & Management Study (see ERWS, 2021). The resulting plan will replace 2011 master planning. It will rely on updated demand and climate forecasts. The objectives of the planning process are “to review the assumptions made in the existing water supply plan, outline measures to mitigate against the impacts of climate change and review alternative supply sources, respond and recover from various types of emergency events as quickly and efficiently as possible, and protect the ecological systems from which we draw water” (City of Parksville, 2022c).

Drought Response

Parksville follows the regional watering restrictions framework (see RDN, 2022).

Arrowsmith Water Service follows the conditions set out in the Conditional Water Licence. It will be seeking for an updated Provisional Operating Rule from the Province, which will amend some of conditions to reflect climate change affecting the river base flow and the intake that had now been moved upstream of the hydrometric gauge.

As noted above, development of the planned Water Use Planning & Management Study starting in 2023/24 will include supply planning for drought.

Demand Management

City of Parksville implements the following water conservation programs:

- The City is fully metered. Almost all accounts have a water meter that is read twice per year, and residents are charged for water services based on the volumes they consume (see City of Parksville, 2021).
- The City participates in RDN’s Team WaterSmart, implements regional watering restrictions as required, and promotes incentives and educational resources from that program to its residents.
- The City responds to system leaks as they are discovered. Recent preliminary analysis of non-revenue water indicates that it is about 10% of total water production.

Emergency Response

City of Parksville has Emergency Response Plans pertaining to the water system. These outline strategies to respond to various events at the Arrowsmith Dam, ERWS Water Treatment Plant, and the overall water system.

Communication with Residents

Communication about water supply occurs mainly through the City of Parksville website and media releases. Links are also provided to RDN's Drinking Water and Watershed Protection Program resource-rich website.

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Water Supply Planning in the Context of Climate Change in the Regional District of Nanaimo Town of Qualicum Beach

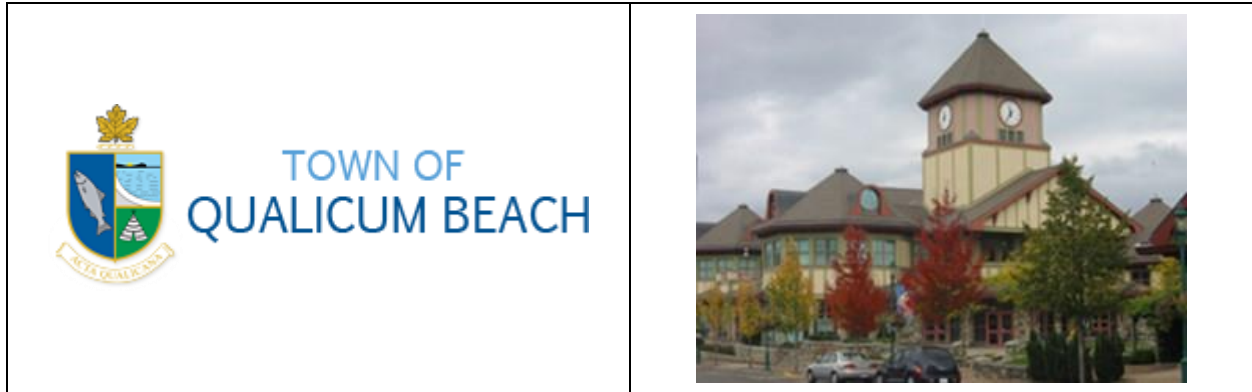


Image: Town of Qualicum Beach

Town of Qualicum Beach Population: 9,303 (2021 Statistics Canada, 2022)

Water Source(s): Groundwater via the Little Qualicum River Well Field (Aquifer 664) and Berwick Well Field (Aquifer 217, seasonal)

Town of Qualicum Beach manages and governs its own water supply. Information in this profile was provided primarily by Town staff in June 2022, supplemented with information from publicly accessible sources (see references section). Additional information on aquifer status is sourced from the Provincial Government Groundwater Wells and Aquifers database or from reports commissioned by the Drinking Water and Watershed Protection Program within the past decade.

Supply

Town of Qualicum Beach's water comes from two sources. The primary source is River well field. Berwick well field provides auxiliary supply. The total production capacity of all the currently commissioned wells is 219.2 litres per second or 18,939 cubic meters (m³) per day (Weir, 2021).

The River well field is comprised of five production wells and two monitoring wells located at the northwest corner of the Town's boundary. The well field draws water from deltaic deposits of the Little Qualicum River in Aquifer 664.

The Berwick well field has four active production wells that provide approximately 30% of annual production, drawing from Aquifer 217 (three wells) and Aquifer 1250 (one well) This is considered an auxiliary source, only used in peak summer season, then left to recharge over winter.

Two additional well sites are held in reserve but are not yet constructed. These are available to address future supply constraints (for example, should saltwater intrusion become a problem at other wells).

Wells feed five reservoirs in three locations (Jones Steet, Berwick, and Village Way) with a combined capacity of 9,100 m³ or 9.1 million litres. Reservoirs feed four pressure zones.

Supply to RDN's French Creek Water Service Area

In 2021, Town of Qualicum Beach began providing bulk water to Regional District of Nanaimo's (RDN) French Creek service area via the Sandpiper Reservoir. RDN continues to own and operate key transmission and distribution infrastructure within the service area. This change was implemented to address aesthetic issues with water formerly supplied by RDN wells (RDN and Town of Qualicum Beach, 2021).

Arrowsmith Water Service

In 1996, The Regional District of Nanaimo, City of Parksville, and Town of Qualicum Beach entered into a joint venture agreement to construct, operate, and maintain the Arrowsmith Dam and associated infrastructure (Arrowsmith Water Service, 2022). Qualicum Beach continues to have an interest in the Arrowsmith Water Service, pays an annual maintenance fee, and is contractually enabled to draw water from Arrowsmith Dam based on a predetermined financial formula. However, the Town has no plans to tap into this supply any time in the foreseeable future, as groundwater sources are considered sufficient. For more information on planning for the Englishman River Water Service, refer to the Town of Parksville's profile, also prepared for this project.

Aquifer Status

Qualicum Beach continuously compiles data on the extent, behaviour, and recharge of the two aquifers it draws from. Aquifer levels, pumping response, temperature, water chemistry, and lack or presence of potential contaminants are regularly monitored. Figures related to monitoring and modelling of this production well are provided publicly in an annual report (Qualicum Beach, 2021).

Town staff assessment is that current groundwater supplies from the combined River/Berwick well system are more than sufficient to meet current demand, including supply to RDN's French Creek service area, and any future growth projected in the Official Community Plan to full community build out.

Aquifer performance trends from observation well in the River well field have been stable to increasing over the past decade, barring 2023, which saw record low levels. The stable trend prior to this is attributed to interactions with timing of releases of stored water at Cameron Lake to support environmental flows and fish habitat in Little Qualicum River (Weir, 2021).

The following table shows the status of the two aquifers that Qualicum Beach draws from. Aquifer productivity rating is sourced from the Provincial Government groundwater wells and aquifers database (see Province of BC, nd). Groundwater level trend is sourced from DWWP Program Regional Groundwater Level Analyses (see RDN, 2023). Current dry season stress level is sourced from the DWWP Program Phase 3 Water Budget project (WSP Golder, 2023), noting that this is a regional level analysis of stress rating and that results from local well field analysis may differ.

Aquifer No.	Aquifer Type	Water Region	Region Code	# of Active Obs Wells (BC & RDN)	Provincial Productivity Rating*	Groundwater Level Trend (2023) **	Current Dry Season Stress Level**
664	Sand & Gravel	Little Qualicum	WR2	1	Unknown	Stable	Very High
217	Sand & Gravel			5	Moderate	Stable to increasing (2 obs wells stable, 3 obs wells increasing)	Moderate

* Source: [Province of BC \(nd\)](#)

** Source: [RDN \(2023\)](#)

*** Source: WSP Golder (2023)

Demand Forecasting

Demand analysis is completed in-house by Qualicum Beach staff and updated annually. Bulk water production statistics are published in the annual report (Qualicum Beach, 2021). Town staff anticipate future demand increases due to population growth and climate change, and also note that per capita demand appears to be plateauing. These assumptions factor into in-house supply planning.

Water Supply Planning

Water Supply Master Planning

Qualicum Beach’s most recent water supply master plan was completed in 2002. Most recommendations in that plan have now been fully implemented. Key planning assumptions are updated regularly in-house by staff. While this master plan is now somewhat dated, there are currently no major drivers to justify the significant cost and effort required to complete a full update.

Drought Response

Qualicum Beach follows a modified version of regional watering restrictions framework from May 15 to September 15 (see RDN, 2022).

Demand Management

Qualicum Beach implements the following water conservation programs:

- The Town is fully metered, and residents are charged for water services based on the volumes they consume following a steeply climbing inclining block rate structure (see Town of Qualicum Beach, 2020).
- System loss (i.e., from leaks) is dealt with on an opportunistic basis rather than through an active leak detection and response program. The Town has acoustic leak detection equipment.
- The Town participates in RDN’s Team WaterSmart program and promotes its incentives and educational resources to residents.
- Internal demand (e.g., from park irrigation) is actively managed.

Consistent with trends across North America, total and per capita water use has declined steadily over recent years, even in the face of increasing population. This is attributed to several factors such as municipal and residential water conservation initiatives, changes to irrigation practices, and improved fixture and appliance efficiency (Weir, 2021).

Emergency Response Plan

Town of Qualicum Beach has an emergency plan that sets out procedures in the event of supply failure or other short-term crisis.

Communication with Residents

Communication about supply occurs mainly through the Town of Qualicum Beach website. Most content is static, but the site includes summary information on supply and distribution, restrictions, links to Team WaterSmart resources, and the water system annual report.

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Water Supply Planning in the Context of Climate Change in the Regional District of Nanaimo RDN Water Service Areas



Image: nanaimonewsnow.com

RDN Water Service Areas Population (nine WSAs): 7,000 (estimate)

Water Source(s): groundwater (all systems) and surface water from Englishman River via Arrowsmith Dam (Nanoose Bay only)

RDN manages and governs its own water supply. Information in this profile was provided primarily by Regional District staff in June 2022, supplemented with information from publicly accessible sources (see references). Information on aquifer status is sourced from the Provincial Government Groundwater Wells and Aquifers database or from reports commissioned by the Drinking Water and Watershed Protection Program within the past decade.

Supply

RDN Water Service Areas

Water Service Area	Year Established	Water Source	Number of Connections
Decourcey	1998	Groundwater (1 well; aquifer 162)	5
River's Edge	2003	Groundwater (2 wells; aquifer 219)	157
French Creek	1980	Groundwater (aquifer 217 supplied via Town of Qualicum Beach)	239
Melrose Terrace	2005	Groundwater (1 well; aquifer 663)	28
Nanoose Bay	2005	Groundwater (5 wells in use; aquifers 214, 219 and 1098) supplemented from Englishman River	2,532*
San Pareil	1999	Groundwater (2 well; aquifer 221)	291
Surfside	1986	Groundwater (2 wells; aquifer 664)	39
Westurne Heights	2016	Groundwater (1 well; aquifer 663)	17
Whiskey Creek	2011	Groundwater (1 well; aquifer 663)	126

* Includes 64 commercial, institutional, and multi-family residential connections

RDN has nine water service areas, ranging in size from five (Decourcey) to 2,532 (Nanoose Bay) connections. All water service areas are supplied exclusively by groundwater, except Nanoose Bay, which receives supplementary supply from surface water (see table above).

In most cases, RDN independently owns and operates all of its bulk supply infrastructure, with two exceptions: French Creek and Nanoose.

French Creek

As of 2021, the French Creek water service area is supplied by Town of Qualicum Beach via the Sandpiper reservoir. RDN continues to own and operate key transmission and distribution infrastructure in this service area. This change was implemented to address aesthetic issues with water formerly supplied by RDN wells (RDN and Town of Qualicum Beach, 2021). Supply planning for this water service is described in the profile for the Town of Qualicum Beach, also prepared for this project, and is not covered further in this profile.

Nanoose Bay Peninsula

Nanoose Bay Peninsula, the largest RDN water service area by an order of magnitude, is supplied by both RDN wells and Arrowsmith Dam via the Englishman River Water Service (ERWS). ERWS is operated by the City of Parksville and supply planning for ERWS is described in the Town of Parksville’s separate water supply profile, also prepared for this project.

Fourteen groundwater production wells are located within the Nanoose Bay Peninsula. Nanoose Wells #2, #3, and #4 are on standby for use during emergencies. Nanoose Well #5 has not been in use since 2002, due to saltwater intrusion, and has been permanently converted to a provincial monitoring well. Nanoose Well #6 has been closed and has not been used since 2010 due to operational challenges with chlorination. Nanoose Well #7 was drilled in 2008 but has not yet been approved for community drinking water supply. West Bay #3 experienced reduced production over time and was replaced by West Bay #4, which was drilled in 2019. Fairwinds Well #1 has also experienced reduced production and was replaced by Tippet Road Well #1, which was drilled in 2020 (RDN, 2021a, see table below).

Well / Name	Well Depth	Wellhead Protection In Place	Treated/Untreated with Chlorine
Wallbrook #1	16.9 m	Yes	Treated
Madrona #4	52.1 m	Yes	Un-treated
Madrona #8	17.1m	Yes	Treated
Nanoose #2	53.3 m	Yes	Treated
Nanoose #3	52.7 m	Yes	Treated
Nanoose #4	59.1 m	Yes	Treated
Nanoose #6	107.0 m	Yes	(Not in use)
Nanoose #7	60.6 m	Yes	(Not in use)
Fairwinds #1	69.8 m	Yes	(Not in use)
Fairwinds #2	75.3 m	Yes	Treated
Fairwinds #3	72.2 m	Yes	Treated
West Bay #4	75.6 m	Yes	Treated
Tippet Rd #1	71.0 m	Yes	Treated
Parker Road	91.4 m	Yes	Treated

Notes: Nanoose #2, #3, and #4 are not currently in use. Nanoose #6 has been permanently closed. **Source:** RDN, 2021a

Other RDN Services

There are two other notable developments with RDN supply planning. First, planning is underway at **River’s Edge** (formerly called the Englishman River System) due to water quality concerns with management of aquifer withdrawals. RDN proposes to install an additional four

to six wells in various locations that would better connect the middle aquifer to the supply. Installing more wells spread over a greater area will allow each well to be pumped at a slower rate, which will reduce the rate of intermixing from the lower to middle aquifer, thereby improving quality. Note that this problem is exacerbated by high per capita demand in this service area.

Second, a well was drilled in the **Whiskey Creek** water service area in 2020. Groundwater has now replaced the existing surface water supply from Crocker Creek. This was completed primarily for water quality reasons rather than supply constraints. Infrastructure for Crocker Creek remains in place and would be available in the event of an emergency.

Aquifer Status for RDN Water Systems

The following table shows the status of the various aquifers that RDN draws from. Aquifer productivity rating is sourced from the Provincial Government groundwater wells and aquifers database (see Province of BC, nd). Groundwater level trend is sourced from DWWP Program Regional Groundwater Level Analyses (see RDN, 2023). Current dry season Stress level Dry season stress level is sourced from the DWWP Program Phase 3 Water Budget project (WSP Golder, 2023), noting that this is a regional level analysis of stress rating and that results from local well field analysis may differ.

Aquifer No.	Aquifer Type	Water Region	Region Code	RDN WSA(s)	# of Active Obs Wells (BC&RDN)	Provincial Productivity Rating*	Groundwater Level Trend (2023) **	French Creek Water Budget 2023 (dry season stress level)***
663	Sand & Gravel	Little Qualicum	WR2	Melrose, Whiskey Creek, Westurne Heights	0	Moderate	N/A	Moderate
664	Sand & Gravel	Little Qualicum	WR2	Surfside	1	N/A	Stable	Very High
664 & 217	Sand & Gravel	French Creek	WR3	French Creek, supplied by Qualicum Beach	See Qualicum Beach Supply Profile			
219	Sand & Gravel	Englishman River	WR4	River's Edge, Nanoose	3	Moderate	Stable to increasing	
221	Sand & Gravel	Englishman River	WR4	San Paniel	0	High	N/A	
1098	Sand & Gravel	Englishman River	WR4	Nanoose	4	Moderate	Increasing	
162	Bedrock	Nanaimo River	WR6	Decourcey	4	Low	Moderate decline to Increasing	

* Source: [Province of BC \(nd\)](#)

** Source: [RDN \(2023\)](#)

*** Source: WSP Golder (2023)

This indicates that some aquifers that RDN depends on are potentially under stress. Further investigation into supply and demand for some of these areas is currently underway through ongoing work under RDN's Drinking Water and Watershed Protection Program. See, for example, Golder (2020) for refined water budgets for the Nanoose Region and WSP Golder (2023) for refined water budgets for the French Creek Region.

Demand Forecasting

Demand forecasting for all of the RDN's water service areas was completed by Econics and Kerr Wood Leidal in May 2020 as part of development of the Water Conservation Plan update (see Econics and KWL, 2020). Projections were developed using a proprietary Excel-based tool created by KWL with support from Econics. This model estimates municipal water demands incorporating best practices often not incorporated in such forecasts (see Pacific Institute, 2016).

Two scenarios were developed for the demand forecast. Scenario 1 has higher relative single family residential demand and Scenario 2 has higher relative non-revenue water. The "best estimate" forecast for Scenario 1 shows a 6% increase in total water demand over 10 years based on assumptions about residential population growth and increased seasonal demand for irrigation. Results from this analysis were used to support finalization of the Water Conservation Plan update.

In addition, RDN staff review water production and consumption trends every year as a component of preparation of water service area annual reports (see, for example, RDN, 2021b).

Water Supply Planning

Water Supply Master Planning

RDN does not have formal master plans for its water service areas. This is primarily because all service areas are fully built out or nearly built out based on current population and density projections in Official Community Plans. The exception is the Nanoose system, which has a comprehensive plan prepared as part of broader ERWS supply planning. As a result, there are no pending plans for major expansion of supply or distribution networks. As well, aquifer levels are monitored on an ongoing basis through RDN's Drinking Water and Watershed Protection Program. Supply is considered sustainable with current population and demand levels, barring ongoing management of localized supply and demand challenges, such as the examples discussed above. Staff are aware of the future threats posed by climate change, continue to monitor, and are actively exploring options for enhancing drought resilience.

Drought Response

RDN follows the regional watering restrictions framework (see RDN, 2022c). Restriction levels may vary from service area to service area depending on supply conditions. RDN has communications plans in place to guide transition from level to level during the summer.

ERWS has dam yield curves that dictate the timing and volume of releases from Arrowsmith Dam. This allows for reducing flow rates during low water conditions within the conditions of the Provincial water licence (i.e., flow may be increased during times of drought, perhaps dictating escalation of summer watering restrictions).

As noted below, emergency response plans for each service area outline procedures in the unlikely event of loss of supply, for example due to drought.

Demand Management

RDN has a comprehensive water conservation plan in place for 2020 to 2030. The plan was prepared by Econics with support from Kerr Wood Leidal (Econics, 2020), and identifies 10 measures under the following five themes:

1. Reduce Outdoor Water Use
2. Commercial, Institutional and Multi-Family Residential Pilot Project
3. Review Water Service Rates
4. Improve Water Use Accounting and Management of Non-Revenue Water
5. Continue Team WaterSmart Outreach Implementation

Implementation of the plan is funded and ongoing.

Emergency Response Plan

RDN has Emergency Response Plans for each service area that contain procedures and contact information to efficiently respond to system emergencies such as contamination of supply, loss of supply, pump failure, and drought management. This plan is reviewed and updated annually and is available as an appendix in annual reports.

The fact that most RDN systems are quite small means that the option to truck water in on a temporary basis is viable in the unlikely event of supply failure. For larger systems, redundant reservoirs and supply sources can be accessed.

Communication with Residents

Communication about water service area supply occurs mainly through the RDN website, which includes profiles of each area, annual reports, water quality test reports, and historical well production curves. Service area alerts are also provided to mobile subscribers of that service.

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Methodology

The methodology for this research involved the three steps described below.

Water Service Provider Interviews

The methodology for the interview portion of the research started with RDN staff identifying and contacting candidates. We interviewed at least one representative from each municipal water service provider and one Provincial Government staff person involved in water allocation licensing. Interview appointments were booked ahead of time, generally a week in advance. The interviewee was sent a copy of a project overview and discussion guide in advance via email. Interviews were conducted using virtual conferencing (Zoom or Teams) and were semi-structured in nature, typically lasting about an hour. Afterwards, the water supply profiles found in this appendix was sent to each municipal informant for validation. Some individuals provided additional feedback, which was incorporated into revisions.

Literature Review

We reviewed several dozen documents directed to us by interviewees or sourced from municipal websites. These included consultants' reports, planning documents, memos for elected officials, public communications material, and various other miscellaneous documents. This literature review served as a source of information for the water supply profiles.

Small Water Service Provider Focus Group

A virtual focus was held on 23 June 2022. This involved 5 attendees from the following water service providers and two observers from RDN's project team.²

- Bowser Waterworks District
- Deep Bay Improvement District
- French Creek Water System (EPCOR)
- North Cedar Waterworks District
- Qualicum Bay-Horne Lake Improvement District

The session started with an overview of the project by the facilitator then moved into plenary discussion. Topics included current water supply situations, supply planning, demand management, demand forecasting, and communication with residents. This session was designed to develop a shared understanding of the key planning issues and opportunities. The event was recorded, and notes were taken. This information was subsequently compiled and analyzed to inform this report.

Profiles for smaller providers are not provided in this appendix, but information on their water supply status can be found in the main report (see Section 4.6).

² Little Qualicum Waterworks District declined an invitation to participate in this focus group, but a representative did provide information on supply planning through a brief phone discussion with our project team. Snaw-Naw-As First Nation was also invited to participate in this project but also declined. Other Indigenous Nation Governments and improvement districts in the region attain bulk supply through another water service provider as documented in Table 3 of the main report.