## DRAFT - JULY 2017



**DISTRICT OF LANTZVILLE** 

Water Master Plan



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# 1 | INTRODUCTION

The Water Master Plan is an opportunity to analyze current constraints to community water provision, better understand community desires for future water provision, and set directions for managing and enhancing Lantzville's water infrastructure and water use in ways that allows the District to provide water that is affordable for the community, sustainable for the environment, and resilient for the future.

## 1.1 ABOUT THE WATER MASTER PLAN

The District of Lantzville currently supplies water to approximately two-thirds of residential and business properties within the Water Service Area defined in the community's Official Community Plan (DoL, 2005). The remaining one-third of properties within the Water Service Area rely on alternate water sources, typically private wells. The District also includes properties in rural and resource areas that are outside the Water Service Area and use private wells for water sources.

Access to a safe, clean, and reliable water source has been a priority issue for the Lantzville community since prior to incorporation. Today, Lantzville's municipal water source comes from groundwater, accessed via wells. The current source provides high-quality water; however, water quantity has been a limitation to fully servicing existing residents and businesses in the Water Service Area and to supporting potential new development in the community. The Water Master Plan considers possibilities for expanding Lantzville's water supply to service existing residents and how the system could expand to support potential future population growth in the community.

A Water Master Plan is a long-term (e.g., 20-year) guiding document. It outlines a series of recommendations for Councils to consider during this period as the community evolves. The recommendations are intended to be considered on an incremental basis, in response to community evolution and ongoing monitoring.

Some recommendations may be carried out over a short time frame to support community decisionmaking (for example, steps to considering extension of community water to unserviced neighbourhoods). Recommendations may also extend over an indefinite time frame (for example, ongoing monitoring of water supply and demands to ensure supply remains resilient for the future). A Water Master Plan is comprised of multiple components that must be considered together – Design Standards, community interests, water supply balanced with community growth, water conservation, and capital improvements are all part of a comprehensive strategy. The Water Master Plan builds on previous studies to address these components and provide consolidated recommendations for consideration:

- Water Design Standards: Today, Lantzville has a single Design Standard (3.4 m³/day or 3,400 liters/ day) for all residential land uses. As Lantzville evolves, it may be prudent to recognize that different land uses will likely have variable water demands. Section 4 proposes future Design Standards for potential future land uses.
- Community Water Service Expansion: Over the years, some Lantzville residents with properties that are not connected to community water service have expressed a desire to obtain connection. Alternately, some residents have expressed preferences to remain on private well. The Water Master Plan is an opportunity to study unserviced properties within the Water Service Area, identify preliminary costs to extend community water service to these areas, and gather neighbourhood input on preferences for community water extension. Section 5 provides recommendations for potential community water service extension to currently unserviced properties.
- Water Supply & Demand: Currently all of Lantzville's community water supply comes from a single groundwater source. The existing groundwater source supply is insufficient to service all existing

residences within the Water Service Area and cannot provide supply for new development. *Section 6* considers future land use directions and growth potential to summarize the relationship between potential future water demand and available water supply.

- Water Conservation: Today, Lantzville residents use less water per capita than most other Vancouver Island communities. This water conscious attitude is likely attributable to a combination of metering, water rates, education, and public awareness and concern about existing water supply limitations. Maintaining this water conservation attitude into the future will benefit the community and the environment and may lower or defer required infrastructure costs. Section 7 proposes recommendations to help maintain water conservation levels.
- **Capital Improvements:** To facilitate future water connections, investment in the District's water infrastructure will be required. **Section 8** identifies proposed infrastructure improvements to conceptually summarize how the water distribution system may evolve over the next 20 years and the estimated costs to support this growth.



November 2, 2016 Community Workshop



June 28, 2017 Community Open House

## 1.2 PROCESS

The Water Master Plan process was undertaken concurrent with Lantzville's OCP Update Process to align water servicing analysis with future potential land use directions being considered. Combined public consultation on the Water Master Plan and OCP Update was undertaking at key points in the process as shown on Figure 1 (page 6). Key points of public input included the following.

#### Community Launch Events & Questionnaire #1

At the onset of the Water Master Plan process the consulting team participated in Minetown Day to raise awareness about the process, provide background information, and obtain initial input from the community.

As a follow-up to this event, a Community Workshop was held on November 2, 2016 at Costin Hall to introduce early concepts and information to participants. As part of these events, a voluntary community questionnaire was circulated to collect initial ideas and help identify issues that should be explored further as the project was developed.

The questionnaire was available at the events and open online from Sept. 12 to Sept. 23 and Nov. 2 to Nov. 22, 2016. A total of 221 people participated in the survey. The water questions targeted early input on community attitudes towards extension of community water services, identification of concerns about water quality or quantity for unserviced areas, opinions on water rates, and participation in water conservation activities. The input was used to consider how unserviced neighbourhoods would be identified and analyzed in the process. Refer to **Appendix B** for a summary of the results.

#### **Kitchen Table Meetings**

Residents throughout the community were invited to host Kitchen Table Meetings in their neighbourhoods, providing residents an opportunity to talk in further detail about potential land use options, housing choices, and water servicing.

Between Nov. 22, 2016 and Jan. 12, 2017 a total of 13 Kitchen Table Meetings were held, each attended by 6 to 12 people. Participants submitted meeting notes and maps, and an individual response form was made available at the meetings and online to record individual opinions. 58 individual response forms were completed. Input received was used to test and refine potential options being considered for water servicing extension to unserviced neighborhoods. Refer to **Appendix C** for a summary of the results.

#### Community-wide Survey

To understand the community's preferences on potential directions being considered for the OCP Update and Water Master Plan, a Community-wide Survey was distributed to Lantzville households.

The survey was delivered via Canada Post to all households in Lantzville the week of March 15, 2017 and were required to be returned by Friday, April 7, 2017. The results were tabulated by a third-party market research and public opinion polling firm. 543 of the 1,482 circulated surveys were returned, indicating a response rate of 37.3%.

The Community-wide Survey collected input from the community as a whole, as well as for each unserviced water neighbourhood to collect specific preferences from individual neighbourhoods. Refer to **Appendix D** for a summary of the results.

#### **Proposed Directions Review**

A public open house was held on June 28, 2017 to provide residents an opportunity to review and provide comment on proposed directions being considered in the OCP Update and Water Master Plan. The Water Master Plan summarized proposed draft directions for water servicing extension, proposed infrastructure updates, and draft design standards.

A voluntary public response form was available at the open house and online from June 28 to July 10, 2017. 111 people attended the Open House and 45 people responded to the response form. Refer to **Appendix E** for a summary of the results.

The Water Master Plan process launched in Aug. 2016 with development of a draft plan completed in July 2017. Figure 1 outlines the six phases in the Water Master Plan process, as well as the phases in the concurrent OCP Update process.



Figure 1: Process Diagram

## **1.3 RELATED PLANS & POLICIES**

#### OFFICIAL COMMUNITY PLAN

Lantzville's Official Community Plan (OCP) was first developed in 2005 and is being in 2017. The OCP is a policy document that describes a community's longterm vision for the community and provides guidance on how this vision may be achieved.

The OCP guides the distribution and type of future growth in Lantzville. Understanding how much growth and where it may be anticipated in the community is important to projecting how much water may be required and how Lantzville's supply and distribution system would need to be improved to support Lantzville's potential growth.

The 2005 OCP identifies Lantzville's Water Service Area which currently includes both serviced and unserviced residential, industrial, commercial, and institutional properties. It also provides policy direction on Lantzville's continued work to secure a reliable, long-term source for providing potable water.

Relevant policies in the 2005 OCP (and anticipated to be carried forward in the 2017 OCP Update) include:

#### 9.2.1 Water Sources and Protection:

- The District will continue to work with local residents, landowners, development applicants, and neighbouring jurisdictions to develop additional water supply options.
- 2. The District will support the continued study of the aquifer within the municipality to acquire better understanding of its extent and degree to which community water supplies can be obtained and secured.
- 3. In the development of municipal infrastructure and facilities, the District will adhere to senior government policies and guidelines aimed at protecting groundwater, streams, and other watercourses.

- 4. Until adequate water supply for the community is developed, the District will limit new development to existing lots currently serviced with water system connections, and will require new subdivision proposals to develop a new water source adequate for the proposed development to standards satisfactory to District of Lantzville, and dedicate that source and related infrastructure to the municipality. The applicant will have to demonstrate that the new source and system will not impact the current system.
- 5. The District will encourage water conservation in homes and businesses, including the use of watersaving fixtures such as small tank and low-flush toilets, water efficient showers, aerated faucets, and drip irrigation systems.

#### 9.2.2 Water Distribution System

The District will pursue the completion of the upgrade to its existing water supply and distribution system.

When additional water supply is acquired, the District will develop a phasing plan to extend the water distribution system to residents who are concerned about the quality and quantity of their water and who are not yet connected to the municipal system and to potential development areas.

- 3. The District will not support use of the water supply for agricultural production or resource related uses.
- 4. The District does not generally support the extension of public water services to residential users in rural and agricultural areas of the community. Access to water service may be provided to address specific public health, safety, fire protection or environmental issues, or to create efficiencies in service infrastructure. Such extensions of water to rural and resource areas shall not result in any decrease in rural or resource lot sizes or increase in densities designated in this plan.

## POLICY 3007-3 WATER SUPPLY AND CONNECTION POLICY

In 2006, Lantzville established a policy to clarify available water supply and identify how requests for new water connections would be considered. The current policy permits no new water connections or extensions to the municipal system until adequate water supply for the District is developed.

The policy further outlines steps forward should an additional water supply be secured:

- Completion of an update to the existing water supply, storage, and distribution engineering study (complete per the 2015 Water Supply & Distribution System Study, KAEL, 2015)
- Adoption of a new water capital plan
- Adoption of:
  - » Development Cost Charges Bylaw (Bylaw No. 52, 2007)
  - » Water Connection Fees Bylaw
  - » Water Parcel Tax Bylaw
  - » Water User Fees (Bylaw No. 124, 2016)
- Granting of extensions on a first-come-first served basis for properties within the OCP Urban Containment Boundary
- Payment for water line extensions by those properties benefiting from the water distribution extension
- Potential for the District to reassess water supply, distribution, and storage capacity at any time prior to authorizing additional connections

Water supply considerations in the policy are brought forward into the Water Master Plan.

#### LANTZVILLE/NANAIMO WATER AGREEMENT

In September 2014, the District of Lantzville and City of Nanaimo approved the Lantzville/Nanaimo Water Agreement that enables Lantzville and Nanaimo to work together to provide water in bulk from the Nanaimo Water System to serve Lantzville.

The Nanaimo Water Agreement identifies a connection fee of \$5,912.26 per dwelling unit (subject to an annual adjustment equal to the consumer price index). If initial connection were to proceed, the District of Lantzville would pay the connection fee for each of the 225 Upper Lantzville lots that are <u>currently</u> connected to the Lantzville Water System, that would be serviced by the new Nanaimo connection.

Future connections to lots that are currently unserviced and all new development connecting to the Nanaimo water system would be required to pay the connection fee at the time they connect.

- Lantzville is required to complete construction of the Lantzville Water system, including the infrastructure connection to the Nanaimo Water System prior to the Commencement Date (the date upon which Lantzville notifies Nanaimo with Council resolution that the Lantzville Water System is ready to accept water) of the agreement.
- The current agreement applies to connection of lots in the Upper Lantzville pressure zone <u>only</u>. Lots within other pressure zones would continue to be serviced by Lantzville's current water supply or other sources.
- The agreement provides servicing for a total of 436 existing lots (225 currently connected to community water + 211 not currently connected) as well as potential for servicing new development at a rate of up to 50 new connections/year (for a total of 1,000 units over a 20-year period).

## LANTZVILLE SUBDIVISION AND DEVELOPMENT BYLAW NO. 55

Lantzville's Subdivision and Development Bylaw outlines requirements for all new development in the District. The existing bylaw requires that all new lots shall be provided with a connection to the municipal water system when such connections are available and if a connection is not available, confirmation is required that each new lot has the capacity to supply 3,400 litres (3.4 m<sup>3</sup>)of drinking water per day from a well within the boundaries of the parcel. The bylaw also requires that subdivision that creates three or more parcels must provide a report from a professional hydrologist that confirms new wells will have no negative impact on existing wells within a 150 metre radius.

## 2015 WATER SUPPLY & DISTRIBUTION SYSTEM STUDY

As a precursor to the Water Master Plan, Lantzville completed a Water Supply & Distribution Study in 2015 to analyze the existing water distribution system and consider the infrastructure requirements that may be needed to support water service connection for unserviced properties within the District's Water Service Area.

The Study provided a series of recommendations for improving the existing water supply and distribution system to:

- Maximize the yield of the existing well field
- Provide sufficient reservoir storage to meet projected future demands
- Meet recommended fire flow demand standards
- Strengthen the water distribution system
- Continue replacement of Asbestos Cement watermains

Facilitate potential servicing of additional properties

Some recommendations from the Study have been completed and outstanding recommendations from the Study are brought forward and updated in the Water Master Plan.

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# 2 | EXISTING WATER SYSTEM

Lantzville's existing water supply system was originally developed by the Lantzville Improvement District (LID) prior to municipal incorporation. Over the years, upgrades and improvements have been made to the system

## 1.4 HISTORY

The history of water in Lantzville began in 1955. Figure 2 provides a brief overview of key historical dates in the evolution of Lantzville's water system.



Figure 2: History of the Lantzville Water System

## 2.1 EXISTING WATER SUPPLY & DISTRIBUTION SYSTEM

Figure 3 and the following descriptions outline key components of Lantzville's existing community water system.

### Water Source

## W WELL FIELD

Currently, Lantzville's water supply is from five active groundwater wells located along Harby Road East. The wells were recently upgraded and reassessed in Spring 2017 by Lowen Hydrogeology Consulting Ltd. (LHC) which showed a well rating of 3,100 m<sup>3</sup>/day. LHC recommends further analysis of the capacity during the driest months (e.g., August/September) to confirm these amounts (LHC, 2017).

Figure 3: Existing Water Supply & Distribution System Overview

#### Water Storage

## R1 WARE ROAD RESERVOIR

From the well field, water is pumped to the District's main reservoir - Ware Road reservoir. The reservoir was constructed in 2006 with a storage capacity of 1,887 m<sup>3</sup>. It is partially buried in the ground with two chambers, which provides the ability to drain one chamber for cleaning/repairs, while keeping the second chamber in operation (KAEL, 2015). The existing Lower Pressure Zone is serviced from the Ware Road reservoir.

## R2 AULDS ROAD RESERVOIR

The Aulds Road Reservoir is located 200 m south of the Ware Road reservoir and is a pre-cast concrete circular tank 240 m<sup>3</sup> in size, built in 1974 (KAEL, 2015). It receives water pumped from the Ware Road reservoir for distribution to the existing Upper Pressure Zone.



### Pressure Zones

Today, Lantzville's water system consists of two pressure zones – the Lower and the Upper Pressure Zone which together service 885 connections.

#### LOWER PRESSURE ZONE

The Lower Pressure Zone services 659 (74%) of properties connected to the Lantzville Water System. The maximum elevation serviced by the Lower Pressure Zone is 97.25 m, and includes most serviced properties on the north side of Island Hwy (KAEL, 2015).

#### UPPER PRESSURE ZONE

The Upper Pressure Zone includes 226 (26%) of connected properties at the 143.6 m elevation and below. Currently, the system mainly includes properties within the Winchelsea area on the south side of Island Hwy and a few properties on the North side of the highway (KAEL, 2015).

#### UNSERVICED AREAS WITHIN THE WATER SERVICE AREA

The Water Service Area, established in the 2005 OCP, encompasses a number of properties that are currently unserviced by municipal water. The Water Master Plan is an opportunity to gauge resident desire in these areas for future water extension to these neighbourhoods.

#### FOOTHILLS DEVELOPMENT AREA

Foothills is a Comprehensive Development Area in the south of Lantzville. Currently planning indicates that the property owner will be responsible for obtaining water from on-site wells sufficient to meet District's Design Standards.

### Distribution

Lantzville's watermains include 11,024 m of PVC (plastic) pipe and 15,359 m of asbestos cement (AC) pipe (KAEL, 2015). The AC pipes are being upgraded over time. The system also includes nominal lengths of Stainless Steel and Ductile Iron pipe for a total of 27,049 m of watermains (KAEL, 2015).

#### Water Management

### PRV PRESSURE REDUCING VALVE

A pressure reducing value (PRV) was built in 2000 and located at the corner of Ware Road and Lantzville Road linking the Upper and Lower Pressure Zones. It can be opened to supply water from the Upper Pressure Zone to the Lower if the Lower Zone pressure drops below a set threshold, which could occur if there was an unusually large demand (e.g., fire).

## NANAIMO WATER CONNECTION

A connection between Lantzville's and Nanaimo's water systems has been constructed. This connection provides a key emergency water source and allows Council the option to consider executing the Lantzville/Nanaimo Water Agreement to extend water connections to existing properties and potential new development in the Upper Pressure Zone.

#### TREATMENT

After water is extracted from the well field and prior to entering the Ware Road reservoir, chlorine is injected in very small doses to eliminate the possibility of bacteria growth (DoL, 2014a).

#### **MANAGEMENT / MONITORING**

The District of Lantzville monitors water quality and quantity at the well field using a SCADA (Supervisory Control and Data Acquisition) system to that collect data. In place since 2007, the SCADA system collects water level data from the wells, manages water treatment, and monitors water use.

## 2.2 COMMUNITY PRIORITIES

During initial input for the project, input was sought on priorities for the evolution of Lantzville's water system. Participants were asked to rank eight potential community water concerns to understand emerging community priorities. This input was used when considering goals and objectives and the elements to be further studied in the Water Master Plan.

The list was ranked in the following order by participants:

- 1. Long-term reliability of the water supply
- 2. Municipal property tax rates (i.e., costs for water distribution infrastructure development and maintenance)
- 3. Emergency water services throughout the community (i.e., fire suppression)
- 4. Municipal water rates (i.e., cost for water bill)

- 5. Increasing water supply to allow more existing homes to connect to municipal water
- 6. Water conservation
- 7. Municipal water connection cost (i.e., cost to connected an unserviced lot to municipal water)
- 8. Increasing water supply to allow new development to occur



# 3 | GOALS & OBJECTIVES

The District of Lantzville endeavours to provide water that is affordable for the community, sustainable for the environment, and resilient for the future.

The following goals and objectives guide the Water Master Plan:

- Potential for Access to Safe Drinking Water for all Properties within the Water Service Area: Existing and future residents in Lantzville's Water Service Area should have the opportunity to connect to a clean, safe water source, reducing concerns about wells with inadequate quality or quantity. This means planning in a proactive manner to determine required water supply and infrastructure to allow extension over time to areas neighbourhoods that need or desire connection.
- Sustainable Future Water Supply: A sustainable water supply provides secure access to water even as a community evolves and climate change effects occur. This includes ensuring continued supply of water during abnormal or emergency conditions, as well as adequate supply for long-term changes in the community including population growth and climate change. Monitoring the water system over time to analyze changes to supply and updating planning will be essential to maintaining a sustainable future system.
- Cost Effective Water System: Cost effective water delivery optimizes capacity and maintains the value of infrastructure assets through planned maintenance and renewal. Required capacity expenditures to maintain the water system should be planned to be implemented in an affordable and predictable manner and water rates should be set to account for ongoing system renewal.
- Responsible Community Water Use: Maintenance of a water system that is affordable for the community and sustainable for the environment requires a commitment to conservation by all system users. Maintaining a tiered water rate structure, educating existing and new residents, and providing incentives for water conservation will be important to ensuring Lantzville continues to value and protect water as a precious resource.



## 4 | WATER DESIGN STANDARD

A Design Standard provides guidance on the amount of water that must be available for each connection to the community water system. These standards consider how much water will be needed to effectively service all connected properties when water demands are at their peak (e.g., on the hottest day of the year) as well as in emergency conditions.

## 4.1 INTRODUCTION

As part of the Water Master Plan, Koers & Associates Engineering Ltd. prepared the report *Water Demand Design Standard Review, 2017 Update*. The purpose of the report was to study current water system demand patterns, both within the District and in nearby water systems, analyze design standards currently in use in the mid-Vancouver Island area, and recommend an updated Design Standard for existing and potential future land uses. The following section summarizes key findings from the report; see **Appendix A** for the full report.

## 4.2 EXISTING DESIGN STANDARD

**Water Design Standard:** The amount of water dedicated for each connection on the District water system. A Design Standard is used to determine how many connections that the District can supply, based on water source ratings. Lantzville's current Design Standard per connection is:

## 3,400 Litres/day per connection (3.4 m<sup>3</sup>/day per connection)

To analyze water use per capita (by each resident), the above number is divided by the average number of residents living in each Lantzville dwelling (2.5 per the 2016 Census). Lantzville's current Design Standard **per capita** is:

### $3,400 \div 2.5 = 1,360$ Litres/day per person (1.36 m<sup>3</sup>/day per person)

The above Design Standard was established prior to Lantzville's incorporation when the water system was operated by the Lantzville Improvement District. It is believed that the 3,400 Litres/day per connection standard was based on the previous requirements that the Regional District of Nanaimo (RDN) used as a Design Standard for developer-built water systems in rural areas that rely on groundwater wells.

## 4.3 ELEMENTS CONSIDERED WHEN DEVELOPING A DESIGN STANDARD

The District of Lantzville has a fully-metered system which has been tracking actual water use at individual water meters as well as at bulk meters for the Upper and Lower Pressure Zones for several years. This data shows trends on current water use in the District. It is important to recognize that in addition to actual water use, several other key elements must be considered when estimating potential future water demands. These considerations are incorporated into the Design Standard to help limit the potential for future short-falls in the water system.

#### 4.3.1 NON-REVENUE WATER

Analyzing future water demands considers both revenue and non-revenue water.

**Revenue Water:** Water that is tracked through individual meters at each property and billed to customers.

**Non-Revenue Water:** Water that has been produced and is "lost" before it reaches the customer. Common sources of non-revenue water are listed below.

Sources of non-revenue water:

- Unbilled Authorized Consumption:
  - » Watermain flushing
  - » Sewer main flushing
  - » Fire department training and actual fire fighting
  - » Public spaces (e.g., parks) irrigation
  - » Public facilities (e.g., outdoor washrooms)
- Apparent Losses:
  - » Metering inaccuracies
  - » Water theft
- Real Losses:
  - » Leakage on transmission and/or distribution mains
  - » Leakage on connections to the customer's meter
  - » Leakage on fire hydrants, air release valves, flushouts

The District maintains bulk meters at the Upper and Lower Pressure Zones to track all water used in the water supply system, including both revenue and nonrevenue water. Non-revenue water can be determined by subtracting individual meter readings from the bulk meter readings:

Upper & Lower Pressure Zones Bulk Meters — Sum of Individual Water Meters

Non-Revenue Water Consumption

The Water Demand Design Standard Review, 2017 Update analyzed non-revenue water consumption from 2011 through 2016, shown in Figure 4. The annual nonrevenue water use during this time was between 11% to 30%, with a 5-year average of 20%. This amount is not unusual for a water system of Lantzville's size, age, and operating pressure. As water infrastructure ages, there is a risk of non-revenue water increasing. Preventative maintenance and replacement of aging equipment can help maintain or reduce non-revenue water.



Figure 4: 5-Year Average Revenue and Non-Revenue Water Consumption (2012 - 2016)

While non-revenue water is not metered or billed, this volume needs to be accounted for as part of the Design Standard as the system generally requires this volume on a regular basis.

#### 4.3.2 CLIMATE CHANGE

Climate change refers to a long-term shift in weather conditions, including both shifts in average conditions as well as shifts in extremes. Water supply may be particularly affected by climate change extremes such as



dry spells and increased average temperatures that could reduce availability of water.

BC's Ministry of the Environment's *Indicators of Climate Change for British Columbia 2016 Update* identifies the following trends which may affect future water supply (Government of British Columbia, 2017):

- Increased average temperature which may reduce moisture in the summer contributing to increased demand for irrigation and declines in groundwater supplies.
- Increased average precipitation which may help recharge groundwater aquifers; however, more extreme events could result in increased flooding and run-off.
- Drier summers which may result in more frequent and severe droughts that strain water supplies.
- Decreased snowpack which reduces the amount of runoff in spring and summer, reducing potential for groundwater recharge and reservoir filling.
- Sea-level rise along BC's coast, potentially straining infrastructure systems and intruding into groundwater supplies, notably in low-lying areas. The 2014 LHC Report reviewed the well field which is approximately 50 m above sea level and concluded that seawater intrusion is not currently an issue, although slightly higher alkalinity, chloride, sulphate, calcium, magnesium, and sodium were observed at Lantzville's Well #9 (LHC, 2014).

Buffers for potential climate change within the Design Standard and monitoring effects on the water supply and distribution system over time will be key to maintaining a clean, secure water supply for existing and future residents.

### 4.3.3 COMMUNITY TRENDS & BEHAVIOURS

Because most water in Lantzville goes to residential land uses, resident behaviour strongly influences water use. *The Water Demand Design Standard Review, Update* 2017 analyzed trends in water use over the past 20 years. Figure 5 summarizes the annual water use demands during this period.



Figure 5: Annual Water Use Demands, 1996 - 2016

Results indicate that from 1998 to 2011, average day demands decreased by more than 25%. Since 2011, demands have remained relatively stable. Population change within the same period has been negligible.

Likely factors that may have contributed to water use reduction in Lantzville over the past 20 years include:

- Community awareness about Lantzville's limited groundwater supply;
- Public education about water conservation;
- Improved water-saving technologies including low water use appliances and low-flow irrigation systems;
- The District's tiered water rate structure, that includes increasing costs with increased consumption. The rate structure has been in place since 2003 and most recently updated in 2016.

It is important to consider that trends and behaviours will continue to evolve. New residents, growth, and/ or reduced concerns about the availability of water may affect water use demands over time. Ongoing monitoring of annual water use will be important to planning for future demands.

### 4.4 CURRENT WATER USE

Each of the 885 properties connected to Lantzville's water system is metered and the meters are read on a quarterly basis. The following trends can be observed about Lantzville's current water use.

#### 4.4.1 MAXIMUM DAY DEMAND (TOTAL)

**Maximum Day Demand:** The maximum volume of water used for the entire community water system during a 24-hour period within a given year. This number is used to estimate the volume of water needed to supply water to the community.

Water Design Standards are developed to accommodate the peak, or Maximum Day Demand. Table 1 summarizes the Maximum Day Demands for Lantzville's community water system over the past 5 years (2002 - 2016).

Table 1:	Lantzville'	s Community	Water Syste	em Maximur	m
Day Dem	ands over	the Past 5 Yea	irs		

Year	Max. Day Demand (m³/day)	Date
2012	1,351	July 14
2013	1,232	July 28
2014	1,421	July 14
2015	1,273	June 15
2016	1,192	July 28
5-year Average	1,295	

Lantzville's Maximum Day Demand has remained consistent over the past 5 years, partly attributable to the negligible change in population<sup>1</sup> and no additional new connections to Lantzville's community water system.

If new connections are added to the community water system, it is anticipated that the total Maximum Day Demands will increase accordingly.

#### 4.4.2 MAXIMUM DAY DEMAND (PER CAPITA)

**Per Capita Demand:** The maximum volume of water used by the average person using the community water system during a 24-hour period of a given year. This number allows estimation of future community demands as community population changes.

Table 2 summarizes Lantzville's Per Capita Maximum Day Demands over the past 5 years (2002 - 2016) based on an unchanging service population of 2,143 persons. The service population estimate is based on the 2011 Census population density of 2.46 capita per dwelling and an estimated 871 residential dwelling units (serviced from 840 individual water meters).

Table 2:Lantzville's Per Capita Maximum Day Demandsover the Past 5 Years

Year	Max. Day Demand (lpc/day)*	Date
2012	631	July 14
2013	575	July 28
2014	663	July 14
2015	594	June 15
2016	556	July 28
5-year Average	605	

The Per Capita Maximum Day Demands have also remained relatively consistent over the past five years, suggesting water use behaviours have not changed substantially during this time.

\*Note: Maximum Day Demands are expressed in m<sup>3</sup>/day for the entire community water system and in lpc/day for per capita analysis.

- » m<sup>3</sup> = Cubic Metres
- » lpc = Litres per Capita
- » 1 m<sup>3</sup> = 1,000 litres

<sup>1</sup> Lantzville's population increased by 5 persons between 2011 and 2016 from 3,601 to 3,605 (Statistics Canada).

#### 4.4.3 COMPARISON WITH OTHER VANCOUVER ISLAND COMMUNITIES

Comparing Lantzville's Maximum Day Demands with other Vancouver Island communities provides context about current community water use behaviours. Table 3 compares the Maximum Day Demand Per Capita of several Vancouver Island communities based on data from water studies completed by Koers & Associates Engineering Ltd. (KAEL, 2017).

Table 3:	Lantzvil	le's Per	Capita	Water	Use	Compared	l with
Other V	/ancouver	Island (	Commu	nities			

Community	Study Year	Max. Day Demand (lpc/day)
Lantzville	2017	605
Saltair	2016	580
Cumberland	2015	600
Ladysmith	2013	720
Nanaimo	1998	1,050
Parksville	1995	1,180
Qualicum Beach	2003	1,420
Campbell River	2017	1,685

Comparison with other jurisdictions shows Lantzville residents use less water on a per capita basis than most residents of other Vancouver Island communities. While Lantzville's current water conservation is excellent, it is important to be aware that changes within the community such as turnover of residents or the perception of increased security about the availability of water could affect water conservation practices.

#### 4.4.4 SEASONAL WATER USE

Community water demands increase substantially in hot, dry summer months, with the Maximum Day Demand often 2 to 2.5 times higher than the Average Day Demand. This is because outdoor water use for activities like landscape irrigation increases substantially during the summer. Figure 7 below, shows Lantzville's average seasonal water use pattern from 2012 to 2014.



Figure 7: Lantzville's Seasonal Water Use Pattern

The 2015 Water Supply & Distribution Study analyzed seasonal demands and identified that July and August have the highest water demands with February or November having the lowest. On average, 25% of the total annual water demand occurs during July and August and the Maximum Day Demand typically occurs in these months as well (KAEL, 2015). Figure 6 summarizes the relationship between water demand and water availability.



demand and water availability share an inverse relationship. Typically, water availability is the lowest in late summer, which coincides with peak municipal demands. The Design Standard must plan to manage potential for water shortage during these critical times.



### 4.5 WATER DEMANDS BY LAND USE

Today, Lantzville uses one design standard for all residential land uses. Most current land uses in Lantzville are singlefamily residential; however, if development occurs in the Village or other areas, other land uses may be developed. The *Water Demand Design Standard Review, Update 2017* (see **Appendix A**) analyzed current demands by land use, as well as standards from other Vancouver Island communities to consider if varied standards for different land uses warrant consideration.

#### 4.5.1 CURRENT LAND USE DEMANDS

The Water Demand Design Standard Review, Update 2017 analyzed individual water meter demands to determine annual demands for different land uses in Lantzville. Figure 8 summarizes average water consumption by land use over five years from 2012-2016 (KAEL, 2017).



Figure 8: Total Water Consumption by Land Use

Because residential land uses are the primary land use in Lantzville (823 of the 885 existing properties connected to community water are residential), they consume the greatest share of Lantzville's water. The large proportion of residential users indicates the importance of balancing residential water demands and supply.

Figure 9 summarizes the average annual demand for each land use type from 2010 to 2014 (KAEL, 2015).



Figure 9: Average Demand Per Service Connection by Land Use

Residential land uses have the second lowest demand per service connection; industrial land uses have the lowest demand. Commercial and public uses have the highest demand, but because there are very few of these land uses in the District, they have significantly less influence on the overall system demands than residential land uses.

The Water Demand Design Standard Review, Update 2017 also analyzed residential lots of different sizes and locations to consider if these parameters affect demands. The analysis indicated a general correlation between increased demand and larger lot size, which is most likely attributable to more water use on exterior landscape areas (KAEL, 2017). Typically, indoor water use does not vary substantially between residential land uses regardless of lot size; however, outdoor water can vary widely. Smaller lots and multiple-family lots typically use less water due to less landscape requiring watering.

The analysis did not reveal a significant difference in consumption based on lot location within Lantzville (i.e., lots of similar size had similar demands regardless of if they were located in the Upper Pressure Zone, Lower Pressure Zone, or on the waterfront) (KAEL, 2017).

The analysis suggests there may be rationale to consider different Design Standards for different types of residential land uses. The proposed Design Standard recommends different standards for single-family and multiple-family land uses to recognize the potential variation in future water demands and allowing a more refined approach to help make sound future management decisions.

### 4.5.2 PROPOSED DESIGN STANDARD

While the primary consideration for the Design Standard is the Maximum Day Demand per capita, the standard must also consider cumulative water requirements for non-revenue water (e.g. utility flushing, public space and facilities, etc.), leakage, peak hour demands, fire flows, mechanical failures and system maintenance, climate change, and emergencies. These requirements are factored into the proposed Design Standard.

Based on analysis and engineering best practices, the Design Standard ranges in Table 4 are proposed. It is suggested that the higher ranges may be applied to larger acreage properties, while the lower ranges may apply to smaller lots.

	Estimated Population Density	Proposed Design Standard		
Land Use Type	(no. people living in one dwelling)	L/Day/Person	L/Day/Connection	
Single-Family Residential	2.4-2.5	1,150- 1,250 L/day/person	2,800- 3,000 L/day/connection	
Multiple-Family Residential	1.2-1.9	900 L/day/person	1,080- 1,710 L/day/connection	
Institutional, Commercial, Industrial	Varies: Non-residential small number of these commercial, and indus development.	land uses have highly variable water demands. Lantzville has a uses, so it is suggested that water demands for each institutional, trial development be assessed independently based on proposed		

Table 4: Proposed Design Standards

Because Lantzville does not currently have multiple-family land uses and therefore no data to confirm actual water use for this land use, the proposed Design Standard is based on standards used in other communities and assumptions about outdoor water use. The Design Standard is set intentionally high for initial planning, with opportunity to consider reduction when analysis of actual water use in Lantzville can be completed.

## 4.5.3 COMPARISON OF DESIGN STANDARD WITH ADJACENT COMMUNITIES

The proposed Design Standard considers alignment with other local communities that have similar climatic conditions and population behaviour including Parksville, Nanaimo, and Fairwinds / Nanoose (RDN). Consistency between Design Standards in adjacent communities is important, especially with the potential implementation of the Lantzville/ Nanaimo Water Agreement. The following table compares residential Design Standards established in adjacent communities and the proposed District of Lantzville Design Standard. Currently, City of Nanaimo and Parksville do not have multiple-family residential Design Standards; however, the Fairwinds / Nanoose does.

Residential Land Use	Proposed District of Lantzville	City of Nanaimo	City of Parksville	Fairwinds / Nanoose (RDN)
Single-Family	1,150- 1,250	1,135	1,364	1,160
Residential	L/day/person	L/day/person	L/day/person	L/day/person
Multiple-Family	900			424-914
Residential	L/day/person	-	-	L/day/person

Table 5: Comparison of Design Standards in Adjacent Communities

## 4.6 DESIGN STANDARD RECOMMENDATIONS

- 1. Develop a Water System Service Bylaw that provides guidance on the Design Standard, community water use, and water servicing costs.
- 2. Prior to implementing an updated Design Standard, complete recommended capital improvements to increase community water storage (see Section 8, Table 11, Item 2.1).
- Complete the emergency connection with the City of Nanaimo to ensure a secure backup is available for emergency situations.
- 4. Consider implementing the following recommended Design Standard for residential properties connected to the District's community water system:

Land Use Type	L/Day/Connection	
Single-Family Residential	2,800- 3,000 L/day/connection	
Multiple-Family Residential	1,080- 1,710 L/day/connection	

- Assess water demands for all industrial, commercial, and institutional development on a case-bycase basis considering proposed activities and engineering best practices.
- Continue ongoing annual monitoring of water use to identify changes in usage patterns and trends. If trends show increased usage patterns, consider updating the Design Standard to reflect current use.
- 7. Re-rate the well field every five years minimum and consider adjusting the Design Standard if well field performance or water levels drop.
- Maintain the existing standard of 3,400 L/day/ connection for properties not connected to the District's community water system.
- 9. Within ten years, review and update the Design Standard considering actual usage and new trends.



## 5 | WATER SERVICE EXTENSION

An objective of the Water Master Plan is to consider potential phasing for future service expansion. This section summarizes community input on potential water servicing extension interests and possible phasing scenarios.

## 5.1 HOW THE COMMUNITY WATER SYSTEM IS FUNDED

#### 5.1.1 COMMUNITY-WIDE COMPONENTS

Many components of the community water system service all users. Costs for these components are shared amongst users funded by water rates and general revenue, supplemented by senior government grants and development (Development Cost Charges and development contributions), as available. Communitywide components include:

- Aquifer monitoring, well maintenance, and pipe upgrading: These activities are ongoing to maintain a resilient water supply. Recent well field upgrades have been completed and there is an ongoing program to replace old pipes and upgrade pipe sizes where needed for fire flows in Lantzville's existing community water service.
- Lantzville/Nanaimo connection: This connection, being constructed in 2017, provides an important emergency back-up and is required if the District chooses to implement the Lantzville/Nanaimo Water Agreement. Once complete, Council would have the option to decide if or when to commence the Lantzville/Nanaimo Water Agreement.
- Reservoir capacity expansion: Current engineering practice is to size reservoirs to accommodate Maximum Day Demand + Fire Storage + Emergency Storage. Based on this formula, the Aulds Road reservoir is significantly undersized and the Ware Road reservoir is slightly undersized. Both reservoirs would need expansion to service future growth, and Aulds Road reservoir, constructed in 1974, is recommended for expansion and upgrades to meet current service demands (KAEL, 2015).

#### 5.1.2 NEIGHBOURHOOD COMPONENTS

Water distribution pipes carry water from the water source to different neighbourhoods and benefit those living in each individual neighbourhood. In some of the Lantzville Water Service Area, water distribution pipes exist, therefore new infill parcels in these areas could connect if water supply was available without water pipe extension. Costs associated with extending pipes to new development or subdivision of large parcels (e.g., in the Village area) would be paid for as a part of new development, so no additional community costs are incurred under new large development scenarios. However, when water pipes need to be extended to existing developed neighbourhoods that do not currently have community water (unserviced neighbourhoods), the costs of the pipe extensions to these areas are a new cost. Pipe extensions to water unserviced neighbourhoods are typically funded by one or more of the following three approaches:

#### Development

Typically, expansion of community water supply (and sanitary infrastructure) corresponds with planned community growth. These systems are expanded as an area 'develops', typically into single or multiple-family homes through rezoning and subdivision. Construction of the required infrastructure is a condition of development.

In the case of extending water services to previously developed water unserviced areas, development of adjacent larger sites may play a role in reducing the costs of extending water services. During rezoning of existing properties, there are opportunities to negotiate developer contributions to offset the impacts of the new development on the community. Often these negotiations include trade-offs, such as higher density development. One item that may be negotiated through new development is servicing. In this scenario, the community would wait until a time when a significant new development application came forward adjacent to a water unserviced neighbourhood and determine if there is an opportunity for this new development to contribute to extension of water distribution pipes to this area, effectively reducing the costs to extend water to existing nearby properties.

#### Strengths of this Funding Option:

• Lowers costs to existing individual landowners

#### Challenges of this Funding Option:

- Driven by development opportunities no guaranteed time frame
- May result in higher-density development

#### Grants

From time-to-time, Senior Governments provide grant funding to fund a portion of community infrastructure projects. These opportunities are competitive and often focus on communities that have health risks related to inadequate infrastructure. Grant funding can often support smaller communities, providing up to two-thirds of the cost of a project. Grant funding can be pursued to offset individual costs if servicing extension is pursued, but cannot be guaranteed.

#### Strengths of this Funding Option:

Could partially offset costs to existing landowners

#### Challenges of this Funding Option:

Competitive and difficult to secure

#### Individual Land Owners (Local Area Service)

In previously-developed Lantzville neighbourhoods such as the Winds or Clark Drive, the establishment of a Local Area Service (LAS) may be considered to support infrastructure development in that neighbourhood in the absence of potential new future development.

The establishment of a LAS requires approval of property owners within the proposed LAS using one of the following three methods:

- A petition signed by at least 50% of property owners representing at least 50% of the assessed value of land in the proposed LAS.
- Council initiative, as long as 50% of property owners representing at least 50% of the assessed value of land in the proposed LAS do not petition against the establishment of the LAS.
- A referendum voted upon by electors in the proposed LAS.

A municipality can borrow money to install the water distribution pipes for the LAS, to be repaid over a defined time period (typically 20 years) through a tax on properties within the LAS. LAS charges are paid annually as a separate line item on a property tax bill. If subdivision were to take place within the LAS during the repayment period, new lots would contribute to the tax, lowering individual costs by sharing the costs between more properties.

#### Strengths of this Funding Option:

Can be completed as soon as local neighbourhood approval is obtained, borrowing is arranged, and design is complete

#### Challenges of this Funding Option:

• Existing residents bear the full cost of the new infrastructure

# 5.1.3 WATER SERVICING COSTS FOR UNSERVICED AREAS

To connect to the community water system, costs for individual residents typically include:

- A one-time connection fee per dwelling unit, currently approximately \$6,000 for a single-family residence<sup>1</sup> (subject to annual adjustment). The connection fee is set by the District and may be required to consider alignment with City of Nanaimo connection fees if the Lantzville/Nanaimo Water Agreement is commenced.
- One-time costs to connect pipes from the watermain at the street to buildings on the individual property (varies by property).
- Local Area Service fees to extend water infrastructure to the neighbourhood (varies by neighbourhood – see Section 5.4 for preliminary cost estimates).
- Ongoing water utility bills based on consumption.

<sup>1</sup> Costs for other types of development such as commercial, multiple-family, industrial, or institutional also would pay a connection fee, typically based on a m<sup>3</sup> calculation of the building area.

## 5.2 UNSERVICED NEIGHBOURHOODS IN THE WATER SERVICE AREA

Today, about two-thirds of properties within Lantzville's Water Service Area are connected to community water. The remaining one-third, in the seven unserviced neighbourhoods shown on Figure 10 below and described on the following page, rely on private wells for water.



#### LEGEND



Unserviced Neighbourhood within the Water Service Area (see next page for description of areas)

Foothills (serviced via independent water source)

Rural / Resource Areas Outside the Water Service Area (no plans for future service)

Figure 10: Unserviced Neighbourhoods within the Water Service Area

The OCP Update identifies 14 Lantzville neighbourhoods, identified as A through N, based on location and land use. The Water Master Plan utilizes these neighbourhood identifiers for the seven unserviced neighbourhoods and adds the letter "W" to specify them as a water neighbourhood. For example, neighbourhood AW is the water unserviced portion of the neighbourhood identified as "A" in the OCP Update.

#### AW: Clark Drive Area

- Approx. 160 existing unserviced lots
- Includes residential properties on Clark Dr W, Parklands PI, Blackjack Dr, Alger Rd, Clark Dr, Aulds Rd, Arbutus Cres, David PI, Elm Rd
- Includes Aspengrove School site

#### **BW: Owen Road Area**

- Approx. 50 existing unserviced lots
- Includes residential properties on Lantzville Rd, Rosalyn Cres, Schook Rd, Wayne Pl, Owen Rd, Nestor Way

#### FW: Fernmar Road Area

- Approx. 8 existing unserviced lots
- Includes residential properties on Fernmar Rd

#### GW: Aats Road Area

- Approx. 5 existing unserviced lots
- Includes residential properties on Aats Rd

#### HW-1: Winds Residential Area

- ▶ Approx. 133 existing unserviced lots
- Includes residential properties on Superior Rd, Harley Dr, Beliveau Rd, Normarel Dr, Eastwind Dr, Southwind Dr, Northwind Dr, Westwind Dr

#### HW-2: Winds Estate Area

- Approx. 56 existing unserviced lots
- Includes estate residential properties on Superior Rd, Stone Rd, Hobsons Rd, Normarel Dr, Lorenzen Ln, Southwind Dr

#### IW: Bayview Area

- Approx. 49 existing unserviced lots
- Includes estate residential properties on Bayview Park Dr, Rumming Rd, Dawn Rd, Sabre Rd

## 5.3 INITIAL PUBLIC INPUT ON EXTENSION OF COMMUNITY WATER

At the onset of the Water Master Plan process, a voluntary community questionnaire was undertaken to collect initial ideas to help identify issues to be explored further in the process. The questionnaire targeted input from participants both currently connected to community water and those who were not connected.

#### Participants Currently on Community Water

Participants were asked their level of support for extending community water to other parts of Lantzville that need or want access to community water. Figure 11 suggests that about half of participants would support extension of community water to other residential areas, while several participants identified concerns about how this may affect water rates or taxes.



Figure 11: Support by Participants Currently Connected to Community Water for Extending Community Water to Residential Areas that Need/Want Municipal Water

#### Participants Not Currently on Community Water

The questionnaire also requested early input from those who are not currently connected to the community water system to understand potential aspects to be further investigated in the study.

Participants were asked if they would like to be connected in the future. As shown in Figure 12, feedback to this question was mixed with about half responding no, a third responding yes, and the remainder unsure at this time. Because this early input included feedback from all unserviced community members, including rural areas and the different neighbourhoods, there was an identified need to look more closely at the needs and wants of individual neighbourhoods as the process progressed.



Figure 12: Desire for Future Connection to Community Water from Participants not Currently Connected

Throughout the process, input was also sought on potential issues with private water supply. As shown in Figure 13, early input suggested about three-quarters of participants felt their current water supply was sufficient, with 10% identifying potential concerns with water capacity and 15% identifying potential concerns with water quality. Identified water quality concerns included boron, iron, sulphur, manganese, arsenic, and coliform/e.coli.



Figure 13: Known Issues with Private Water Supply

## 5.4 NEIGHBOURHOOD OPTIONS

To help residents in the different unserviced neighbourhoods consider their level of desire for extending community water, cost range scenarios were developed, estimated, and refined for individual properties to extend water servicing to and within their neighbourhood.

The community cost to bring water to an unserviced neighbourhood is based on the length of distribution pipe required. This cost is divided among the parcels connecting to determine per parcel costs. Where there are more lots to divide the costs (e.g., areas with smaller lots or multiple-family lots) the cost per parcel is typically less. Where pipes must be extended long distances between the neighbourhood and existing water distribution network or large lots increase pipe distance between each property, costs are typically more.

Estimated costs are based on infrastructure costs to extend water service pipe to the neighbourhood and are per parcel, per year, for a financing period of 20 years (excluding one-time water supply connection fees or onparcel piping to buildings). The cost ranges developed were rough estimates (+/- 30%) to gauge public opinion and were based on 2016 Dollars based on conceptual layout (all costs are as of October 2016 when the ENR Construction Cost index was 10,434). Factors including detailed design, inflation, and unknown constraints would affect estimates.

The options were drafted and reviewed with the community through the Kitchen Table Meetings and January 18 Community Workshop to verify and refine the options being considered. The refined scenarios were tabled for community response during the Communitywide Survey. Each neighbourhood had two or three potential scenarios:

- **Option A:** Community water extension is not pursued at this time.
- Option B: Community water is extended with no outside financial assistance from new development or grants. Cost ranges represent the cost of extension split between the existing number of parcels in the neighbourhood and assumes there will be no significant subdivision in currently unserviced areas within the planning period. If subdivision or grants were available, costs may be reduced.
- **Option C:** In neighbourhoods adjacent to identified potential future development areas (i.e., large lots that could be subdivided under the current OCP), community water is extended to existing properties as a condition of new development, reducing the infrastructure costs to then extend water service to existing neighbourhoods. Areas FW, GW, and IW are not adjacent to new development areas, so do not include Option C.

The following pages summarize the scenarios presented and feedback from each neighbourhood collected in the Community-wide Survey. Survey responses were filtered by neighbourhood to confirm that participants only provided input on the unserviced area in which they identified as owning property. Other responses were excluded because they would not be part of the neighbourhood who would be potentially funding water pipe extensions to service the neighbourhood.

The filtering process indicated that some participants provided input on areas outside their unserviced area. Many of these responses may include participants who reside in other neighbourhoods (e.g., Area C) which are already serviced by water, but the participants may not have water service at their property due to existing policy limiting new connections.

*Section 5.6* proposes phasing for future water service extensions based on this input.

#### AW: CLARK DRIVE AREA



#### **Estimated Costs**

Because Area AW is adjacent to existing water distribution infrastructure and costs would be split between a larger number of lots, costs to extend community water service to this area is less than other neighbourhoods.

Option	Estimated Cost Range per Parcel*	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$1,550 to \$1,800/yr for 20 years	Factors including detailed design, inflation, and unknown
OPTION C: Extension to existing parcels when new development occurs.	\$1,350 to \$1,650/yr for 20 years	constraints would affect estimates.

### Public Feedback

- Number of Community-wide Survey participants from Area AW: 53
- Approx. number of lots in Area AW: 160
- The results indicate that 70% of survey participants supported water extension to Area AW, with just over half (51%) preferring extension in the absence of significant new development to lower the cost (Option B)



#### **Recommended Approach**

There appears to be sufficient support in Area AW to warrant short-term consideration for water service extension, subject to neighbourhood approval, even in the absence of new development.

#### BW: OWEN ROAD AREA



#### **Estimated Costs**

Extension of servicing infrastructure to area BW would require lengthy distribution pipes and costs which would be divided between a relatively small number of lots, leading to higher servicing costs. If future development occurred in this area, watermains would be brought closer to existing residential areas, significantly reducing costs for existing residents.

Option	Estimated Cost Range per Parcel	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$2,500 to \$2,950/yr for 20 years	Factors including detailed design, inflation, and unknown
OPTION C: Extension to existing parcels when new development occurs.	\$1,900 to \$2,250/yr for 20 years	constraints would affect estimates.

#### Public Feedback

- Number of Community-wide Survey participants from Area BW: 26
- Approx. number of lots in Area AW: 50
- The results indicate that just over half of participants (54%) support water extension to Area BW, with most preferring to wait for new development to lower the cost (Option C)



#### **Recommended Approach**

Feedback suggests that opinions about water extension to Area BW is mixed. It is recommended that extension be deferred to later phases, with further consideration if new development occurs in the area, potentially reducing costs.

#### FW: FERNMAR ROAD AREA



#### **Estimated Costs**

Area FW is a small water service neighbourhood, but is directly adjacent to existing water infrastructure helping to limit potential extension costs. No new significant development is anticipated adjacent to the site, although water servicing and upcoming sewer phasing, may provide opportunity for large lots in this area to consider subdivision based on the existing OCP residential land use designation. This assumption is not included in the below calculations, but if subdivision occurred, individual costs would likely be reduced by being split between more parcels.

Option	Estimated Cost Range per Parcel	* Costs D estin
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) and base concepti
OPTION B: Extension to existing parcels only (no significant new development).	\$2,050 to \$2,450/yr for 20 years	Factors detaile inflatio

\* Costs ranges are Class D estimates (+/- 30% accuracy) in 2016 dollars and based on conceptual layout. Factors including detailed design, inflation, and unknown constraints would affect estimates.

#### Public Feedback

- Survey sample size too small to provide meaningful results
- Direct discussion with area residents should be undertaken when considering potential connection to confirm majority preference
- Implications of new subdivision made possible by upcoming sewer servicing should be considered in future neighbourhood discussions

#### **Recommended Approach**

Given the location of Area FW to existing infrastructure, short-term consideration for water service extension, subject to neighbourhood approval, may be warranted.
## GW: AATS ROAD AREA



## **Estimated Costs**

Area GW is a small water service neighbourhood and would require a significant distance of watermain extension to allow connection. There is no anticipated significant future development in this area that would further reduce costs, resulting in high servicing costs for this area.

Option	Estimated Cost Range per Parcel	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$3,600 to \$4,250/yr for 20 years	Factors including detailed design, inflation, and unknown
		constraints would affect estimates.

## Public Feedback

- Survey sample size too small to provide meaningful results
- Direct discussion with area residents should be undertaken when considering potential connection to confirm majority preference

## **Recommended Approach**

Given the limitations to efficient servicing for Area GW, it is recommended to be considered in later phases.

## HW-1: WINDS RESIDENTIAL AREA



## **Estimated Costs**

Area HW-1 is separated from existing water infrastructure by rural lands, contributing to a higher overall cost to extend water service to the neighbourhood. Because there are many lots in the area, costs are split between more residents helping reduce individual costs. The Winds includes a large potential development site which would reduce the cost of servicing extension if developed; however, there are mixed opinions in the community about development of this site.

Option	Estimated Cost Range per Parcel	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$1,900 to \$2,200/yr for 20 years	Factors including detailed design, inflation, and unknown
OPTION C: Extension to existing parcels when new development occurs.	\$900 to \$1,050/yr for 20 years	constraints would affect estimates.

### Public Feedback

- Number of Community-wide Survey participants from Area HW-1: 49
- Approx. number of lots in Area HW-1: 133
- The results indicate that just over three-quarters of participants (76%) support water extension to Area HW-1, with a close mix between extending in the absence of new development (Option B) and preferring to wait for new development to lower the cost (Option C)





## **Recommended Approach**

There appears to be sufficient support in Area HW-1 for short-term consideration for water service extension, subject to neighbourhood approval. Opinions about whether this should coincide with future development or in the absence of development are mixed, likely attributable to the varied opinions about development in the area.

## HW-2: WINDS ESTATE AREA



### **Estimated Costs**

Area HW-2 is the estate residential portion of the Winds. The large lot size requires lengthy distribution infrastructure shared between a limited number of residents, which in turn, contributes to higher servicing costs. If future development occurred in adjacent areas, it would bring servicing mains closer to the neighbourhood, reducing the costs to a degree, but costs would remain relatively high due to the large estate lot frontages.

Option	Estimated Cost Range per Parcel	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$4,300 to \$5,050/yr for 20 years	Factors including detailed design, inflation, and unknown
OPTION C: Extension to existing parcels when new development occurs.	\$2,250 to \$2,700/yr for 20 years	constraints would affect estimates.

### Public Feedback

- Number of Community-wide Survey participants from Area HW-2: 24
- Number of lots in Area HW-2: 56
- The results indicate that just over half of participants (54%) do not support water extension to Area HW-2 at this time.



### **Recommended Approach**

Feedback suggests there may not be sufficient support at the current time to pursue servicing extension to the Estate Residential area of the Winds. Neighbourhood opinions should be reassessed once other phases are complete.

## IW: BAYVIEW AREA



## **Estimated Costs**

Area IW is the furthest neighbourhood within the Water Service Area to which to extend water. The neighbourhood is relatively distant from the existing watermains and complicated by community boundaries. The land use for this area is estate residential, which limits opportunity for future development that could lower servicing costs. The distance and limited number of lots result in relatively high water extension costs.

Option	Estimated Cost Range per Parcel	* Costs ranges are Class D estimates (+/- 30%
OPTION A: No community water extension to this neighbourhood.	\$0	accuracy) in 2016 dollars and based on conceptual layout.
OPTION B: Extension to existing parcels only (no significant new development).	\$3,300 to \$4,000/yr for 20 years	Factors including detailed design, inflation, and unknown
		constraints would affect estimates.

## Public Feedback

- Number of Community-wide Survey participants from Area HW-1: 9
- Number of lots in Area HW-1: 49
- The results indicate that over three quarters (78%) of survey participants do not support water extension to Area IW



### **Recommended Approach**

There appears to be insufficient support in Area IW to warrant consideration for water service extension to this neighbourhood at this time. Neighbourhood opinions should be reassessed once other phases are complete.

# 5.5 WATER QUALITY & QUANTITY IN UNSERVICED NEIGHBOURHOODS

Over the years, residents using private wells have identified concerns about water quality and quantity. Input suggests concerns can vary by neighbourhood and by individual property, with one neighbour having sufficient high-quality water adjacent to a landowner with concerns about quality and/or quantity. The Community-wide Survey continued the line of questioning about water quality and quantity.

### Well Testing

Well testing of individual wells is voluntary. Private landowners may choose to test their wells to determine the safety and reliability of their water supply, but it is not required. Often wells are tested during purchase of property but this information may not be available. The Community-wide Survey requested public input on well testing.



Figure 14: Community-wide Survey Feedback on Well Testing

## Water Quality

The Community-wide Survey responses showed similar results to initial input suggesting that about three-quarters of residents feel they have acceptable water quality.



Figure 15: Community-wide Survey Feedback on Water Quality

Analysis of the results by neighbourhood showed the following trends:

- Area AW: Clark Drive showed the highest level of concern about water quality at 29%
- Area HW: The Winds showed the second highest level of concern about water quality at 19%
- Areas BW: Owen Road Area and IW: Bayview showed lower levels of concern about water quality at 15% and 13% respectively

#### Water Quantity

During the process, residents expressed concerns about long-term water quantity, especially if new private wells are developed. The primary concern identified is that new wells will reduce the water available for existing wells, leading to water quantity reductions over time.<sup>1</sup> Just over 70% of Community-wide Survey participants felt their existing water quantity was sufficient.



Figure 16: Community-wide Survey Feedback on Water Quantity

Analysis of the results by neighbourhood showed the following trends:

- Area AW: Clark Drive showed the highest level of concern about water quantity at 42%
- Area IW: Bayview showed the second highest level of concern about water quantity at 30%
- > Area BW: Owen Road showed the third highest level of concern about water quantity at 24%
- Area HW: The Winds showed the lowest level of concerns about water quantity at 15%

#### **Fire Protection**

Community water supply includes provision of fire hydrants and areas without community water do not have access to fire hydrants. Almost three-quarters of Community-wide Survey participants expressed a desire for fire protection within their neighbourhood.





<sup>1</sup> Lantzville's existing subdivision bylaw requires new subdivision to three or more properties to complete hydrogeological analysis to confirm existing wells will not be affected; however community concerns remain about potential cumulative impacts.

# 5.6 WATER SERVICE EXTENSION PHASING

The following map proposes an anticipated sequence for extending water services to properties within the Water Service Area. Four key variables affect water service phasing:

- Infrastructure Sequencing: Like sewer, water infrastructure must be phased in a logical manner, extending from existing watermain lines to adjacent neighbourhoods, before extending out to more distant neighbourhoods.
- Neighbourhood Interest: The costs to extend water infrastructure (i.e., water distribution pipes) to an existing neighbourhood will be paid by existing residents through establishment of a Local Area Service (LAS). For a LAS to be created, at least 50% of the neighbourhood must be in support. Water will typically be offered in earlier phases to neighbourhoods that demonstrate stronger support for water service.
- Water Resiliency: Water quality and quantity are key considerations for community water, with priority consideration for areas that may have risks. Generally, water quality and quantity concerns appear to align with neighbourhood interest for community water service.
- Future Development: When new development occurs, municipal services are expanded with construction of required infrastructure as a condition of development or density bonus. If new development occurs adjacent to existing unserviced neighbourhoods, costs to extend water service to existing neighbourhoods may be reduced.



Figure 18: Proposed Phasing for Future Water Service Extension

# 5.7 WATER SERVICE EXTENSION RECOMMENDATIONS

- 1. Prior to implementing water service extension to existing neighbourhood, complete recommended capital improvements to increase community water storage (see Section 8, Table 11, Item 2.1).
- 2. Maintain the Water Service Area identified in the 2005 Official Community Plan.
- 3. Upon completion of infrastructure updates, consider allowing unserviced properties within areas where water service infrastructure already exists to apply to connect to the community water system on a first come first serve basis.
- 4. Budget sufficient water supply to allow future servicing of the seven existing unserviced neighbourhoods (AW, BW, FW, GW, HW-1, HW-2, IW) within the Water Service Area. Release of this water budget may warrant consideration in the medium- to long-term if the neighbourhood does not support expansion and other priorities are identified by Council.
- Consider establishing Local Area Services in the shortto medium-term for the following Phase 1 Service Expansion Neighbourhoods shown on Figure 18 which are adjacent to existing water service lines, subject to approval by current residents:
  - » AW: Clark Drive Area
  - » FW: Fernmar Road Area
- 6. Monitor development potential that could reduce the water service extension costs for the Phase 1 Service Expansion Neighbourhood HW-1: Winds Residential. If, in five years development is not anticipated or neighbourhood residents bring forward a petition signed by at least 50% of neighbourhood residents representing at least 50% of land value, consider establishing a Local Area Service for HW-1 to pursue water extension in the absence of new development, subject to approval by current residents.

- When Phase 1 water service extensions are complete, reassess neighbourhood opinions about extending water services to the following Phase 2 Expansion Neighbourhoods shown on Figure 18:
  - » BW: Owen Road Area
  - » GW: Aats Road Area
  - » HW-2: Winds Estate Residential
  - » IW: Bayview

Water extension to the Phase 2 Expansion Neighbourhoods may be considered in a shorter time frame if neighbourhood residents bring forward a petition signed by at least 50% of neighbourhood residents representing at least 50% of land value.

- 8. Areas identified as Development Driven Expansion Areas on Figure 18 may be considered for servicing as part of development approval processes. Where development-driven expansion is being considered, extension design should be developed to support extension to existing neighbourhoods desiring community water.
- 9. No areas outside the Water Service Area have planned water service extension. In some instances, on a case-by-case basis, community water service (for domestic use only) may be extended to existing properties outside the Water Service Area to address health or environmental concerns.



# 6 | WATER BUDGETING: SUPPLY & DEMAND

Communities undertake water supply and demand analysis to compare potential community growth with how much water is and could be available in the future to ensure water supply remains resilient as the community evolves. This section reviews capacity of Lantzville's existing and potential future water supply against potential future growth based on emerging policies in the OCP Update.

## 6.1 BACKGROUND

Lantzville's existing water supply is from groundwater accessed via wells on Harby Road East. This existing supply is insufficient to service all existing properties in Lantzville or to support new development.

To address water limitations, the community has improved the existing well infrastructure, reviewed Design Standards (see **Section 4**), and worked towards securing additional water sources, including drafting the Lantzville/Nanaimo Water Agreement. Extension of the water system will require decisions about if and when to further develop potential water sources.

The Water Master Plan analyzes four water supply and demand scenarios and summarizes the potential water service extensions that could be serviced under each scenario. In preparing the scenarios, it is important to recognize that well yields and water quality can vary over time due to climate change, recharge area modification, or earth movements (e.g., earthquakes or blasting). All data used in the Water Master Plan is subject to ongoing monitoring and updates over time.

Future projections of both population growth and water supply are estimates only. Actual numbers are influenced by a wide range of variables including individual land owners decisions, innovations, technology changes, natural variables and more. The actual water use in 20 years' time will, in all likelihood, be higher or lower than the predictions. The budget, however, provides a yardstick for long-term planning.

## 6.2 PRESSURE ZONES

**Pressure Zone:** A water distribution system is divided into pressure zones. A pressure zone is an area of water service supplied from a constant storage source such as a reservoir.

Currently, Lantzville has two pressure zones – the Upper Pressure Zone and the Lower Pressure Zone (refer to **Section 2.2** for details). During the water budgeting exercise, the potential need for the addition of a third pressure zone has been identified. This zone, called the Middle Pressure Zone, would service the unserviced areas in the southeast end of Lantzville around Clark Drive.

The potential need for a Middle Pressure Zone arises from limitations in the current Lantzville/Nanaimo Water Agreement. The agreement stipulates that:

- Nanaimo water may only be used to service the Upper Pressure Zone. Properties in the Lower Pressure Zone must be connected to District of Lantzville groundwater.
- Water is provided by the agreement to supply up to 436 existing developed properties in Upper Lantzville, 225 of which are the existing Winchelsea neighbourhood connections, leaving 211 potential connections for currently unserviced existing properties in the Upper Pressure Zone.
- The Lantzville/Nanaimo Water Agreement differentiates between allocation of connections to <u>existing</u> and <u>new</u> development and does not currently allow the allocated <u>new</u> connections to be used to connect <u>existing</u> unserviced properties.

Existing unserviced properties in Upper Lantzville that require servicing from an elevation above that which can be supplied by the Lower Pressure Zone include:

Unserviced Neighbourhood	Approx. No. of Potential Future Connections
Area AW: Clark Drive	160
Area BW: Owen Road	44
Area FW: Fernmar Road	8
Area HW-1: Winds Residential	133
Area HW-2: Winds Estate	56
Area IW: Bayview (Upper)	40
APPROX. TOTAL:	441

These numbers indicate that there are approximately 230 existing unserviced properties in Upper Lantzville that are beyond the allowances in the Lantzville/ Nanaimo Water Agreement (441 existing units – 211 available connections = 230 additional connections required).

The creation of the Middle Pressure Zone would allow Lantzville groundwater to be available to service the 160 existing properties in the Clark Drive Area. This would support potential for short-term water supply extension to all properties identified as Phase 1 Service Expansion Neighbourhoods (see Figure 18), including AW: Clark Drive, FW: Fernmar Road, and HW-1: Winds Residential.

There would be also potential to service a portion of the Phase 2 Service Expansion Neighbourhoods (see Figure 18); however, there would be about 60 additional connections needed to service all of the unserviced existing properties in the Upper Pressure Zone. Further planning would be required to expand water service to all existing properties in the Upper Pressure Zone, through:

- Amendment of the Lantzville/Nanaimo Water Agreement to support allocation of <u>new</u> connections that allow the servicing of both <u>existing and new</u> development.
- Physical infrastructure that would provide opportunity for Lantzville groundwater to service remaining existing units.

### PROPOSED PRESSURE ZONES

Figure 19 outlines the proposed future pressure zones.

#### LOWER PRESSURE ZONE

The Lower Pressure Zone would remain as existing, with a top water elevation of 97.25 m. The area would continue to be serviced by Lantzville groundwater via the Ware Road reservoir.

#### UPPER PRESSURE ZONE

The Upper Pressure Zone would include properties to the extent of the Water Service Area, with the exception of the Clark Drive Area. The area would be serviced by a proposed new dual reservoir in the Foothills with a top water elevation of 158 m, supplied by water from Nanaimo.

#### PROPOSED MIDDLE PRESSURE ZONE

The proposed Middle Pressure Zone would include properties in the Clark Drive Area. The area would be serviced by the proposed new dual reservoir in the Foothills, using Lantzville groundwater pumped from Ware Road Reservoir.

**Dual Reservoir:** A water reservoir that has two or more cells that can be used separatly or in conjunction. For example, Ware Road Reservoir has two cells that could be used separately if required.



Figure 19: Potential Future Water Pressure Zones

#### 6.2.1 EXISTING WELLS

The existing well field consists of five producing wells (#4, #5, #6a, #9, and #12) and a number of inactive test wells. Groundwater levels in the aquifer fluctuate throughout the year, lowering as much as 3 m (10') during the hot, dry summer months when water is in highest demand.

In 2014, the District retained Lowen Hydrogeology Consulting Ltd. (LHC) to complete pumping tests on the four producing wells being used at that time (#4, #6, #9, and #12) to confirm yield. LHC reporting analyzed well drawdown interference (i.e., how much use of one well affects water levels in adjacent wells) and long-term capacity. Tests showed that the combined capacity of the four active wells was 2,424 m<sup>3</sup>/day. The report stated that drilling additional well sites at the well field was not advisable due to the combined water level drawdown during simultaneous pumping (LHC, 2014).

In 2015, further analysis was completed to identify opportunities to improve the efficiency of the existing wells. Wells can become inefficient due to design flaws and deposition of fine grained material around the well screens. The analysis suggested Lantzville wells were operating at an efficiencies between 28% to 73%, suggesting upgrades should be completed for all wells to increase yield at the well field (LHC, 2015).

Table 6 summarizes upgrades that were completed to the wells, which included an additional well (#5) being reconnected.<sup>1</sup> Once upgrades were complete, retesting was undertaken in March 2017 and revealed an increased production rate from 2,424 m<sup>3</sup>/day to 3,100 m<sup>3</sup>/day (LHC, 2017).

LHC recommended updated testing in summer 2017 to confirm yields under dry summer conditions.

The Water Master Plan assumes an availability of  $3,100 \text{ m}^3/\text{day}$  from the well field source.

1 In 2002/2003 Well #5 was abandoned due to its interference with Well #6, which showed in no increase in overall water production with both wells running. With the replacement of Well #6 with Well #6a, Well #5 was retested and was confirmed to provide benefit when running with the new well.

Well #	Combined Well Capacity Prior to Upgrades (m³/day)	Upgrades Completed	Combined Well Capacity After Upgrades (m³/day)
#4	901	<ul><li>Well back-flushed and rehabilitated</li><li>New pump and variable frequency drive</li></ul>	803
#5	-	<ul> <li>Well to be brought back online</li> </ul>	420
#6a	668	New well installed to replace #6	801
#9	281	<ul><li>Well back-flushed and rehabilitated</li><li>New pump and variable frequency drive</li></ul>	518
#12 574		<ul><li>Well back-flushed and rehabilitated</li><li>New pump and variable frequency drive</li></ul>	562
Max. Combined Capacity	2,424		3,104

#### Table 6: Well Capacity Ratings for Well Field Prior to and After Upgrades

# 6.2.2 LANTZVILLE/NANAIMO WATER AGREEMENT

In 2014, after many years of negotiation, the District of Lantzville and City of Nanaimo signed the Lantzville/ Nanaimo Water Agreement as a step to considering potential provision of Nanaimo water to parts of Lantzville's water supply system.

In 2017, Lantzville is completing required construction to facilitate a physical connection with the Nanaimo Water System. After construction is complete, Council will have the option, through Council resolution, to consider commencing the agreement. At the time of commencement, the District would be required to pay a connection fee of approximately \$1.33 million for the 225 Upper Pressure Zone connections that are already connected to community water and would become serviced by Nanaimo water.

If Council resolved to commence the Lantzville/Nanaimo Water Agreement, water would become available to service up to 436 existing properties in the Upper Pressure Zone (225 currently connected + an additional 211 unserviced existing properties). Water supply for new development in the Upper Pressure Zone would also be permitted at a rate of 50 new connections/year.

The agreement stipulates that water connections will only be provided to properties within the Upper Pressure Zone, requiring properties within Lantzville's other Pressure Zones to be serviced via alternate sources.

The Water Master Plan assumes an availability of 1,265 m<sup>3</sup>/day for the 436 initial connections and the annual addition of 145 m<sup>3</sup>/day every year to support the 50 new development connections (2,900 m<sup>3</sup>/day after 20 years).<sup>2</sup>

## 6.2.3 POTENTIAL NEW WELLS

There may be potential for additional groundwater sources within the District of Lantzville, although previous District exploration has not identified further sources at the time of the Water Master Plan.

However, as future development is considered, water supply exploration may reveal additional groundwater sources that could further provide water, to the Lower and Middle Pressure Zones.

The Water Master Plan scenarios in the next section suggest an approximate supply that would need to be obtained to achieve full build-out of the OCP and to look beyond a 20-year horizon.

## 6.2.4 OTHER SUPPLY OPTIONS

As a community evolves, it is important that options for the future of water continue to be considered. Options not currently being explored in this Water Master Plan, such as additional capacity from the City of Nanaimo, connection with other water supply providers, or further water source identification may be revealed in the future as alternates or additions to the sources being considered in this Water Master Plan.

<sup>2</sup> The water supply estimate for the City of Nanaimo connection is based on Lantzville's proposed residential Design Standard of 2,800 - 3,000 I/day/connection (see Section 4), assuming an average of 2,900 I/day/connection (2.9 m³/day/ connection) and multiplied by the number of connections stipulated in the Lantzville/Nanaimo Water Agreement.

# 6.3 WATER BUDGETING: SUPPLY & DEMAND

#### 6.3.1 INTRODUCTION

The water budgeting approach provides a framework to consider the relationship between water supply options and water allocation to meet existing parcels and potential future growth.

The concept of Water Budgeting parallels other budgeting exercises, for example, financial budgeting:

#### **Financial Budgeting:**

Money In – Money Out = Excess or Deficit

#### Water Budgeting:

## Water In (Water Supply) – Water Out (Water Demand) = Water Excess or Deficit

In both forms of budgeting, circumstances change over time, and budgets need to be regularly monitored and reviewed, and adjustments made to reflect actual circumstances.

On the **Water Supply (Water In)** side of the budget, *Section 6.2* introduces potential water supply options for Lantzville. Decisions are yet to be made regarding which supply options to implement.

On the Water Demand (Water Out) side of the equation, Section 5 summarizes community engagement about desires and priorities for extension of the community water system. Water demand will be driven by potential connections to existing unserviced parcels, as well as potential growth through infill and development of new parcels. Both the 2005 OCP and the 2017 OCP Update consider ranges of potential densities and distribution of limited growth. Growth rate clearly has a significant impact on water supply planning and will likely experience swings in the annual growth rate, driven by both local and external factors. Predicting future populations for water supply planning is always uncertain. The key is selecting a reasonable prediction, based on a 20-year horizon. For the purpose of planning for Lantzville, growth considers potential future buildout of the OCP, although any estimate of OCP capacity for growth is very approximate, and there is usually less growth than an OCP would technically allow, due to individual landowner decisions.

# 6.3.2 UNCERTAINTIES AND ADAPTIVE MANAGEMENT

Many uncertainties and future decisions will affect water budgeting, for example:

- Final information on capacity of the existing well fields after testing during dry season.
- Changes to the well field and related aquifer performance over time, including the potential effects of climate change.
- Water conservation behaviour of Lantzville residents and potential changes in behaviour driven by factors such as fewer restrictions on available water or refinements in public awareness or pricing.
- Future desire for extension of community water to existing unserviced neighbourhoods.
- Provision of community water to new development, considering the amount and form of land use, with typically less water use per capita in multiple-family developments than in single-family or large lots.
- Individual landowner decisions to subdivide properties.
- Decisions about potential additional water supply, such as identification of additional groundwater wells or implementation of the Lantzville/Nanaimo Water Agreement.

All of these uncertainties will change over time, as water supply decisions are made and decisions on development approvals and development implementation are phased incrementally.

#### 6.3.3 WATER BUDGETING SCENARIOS FRAMEWORK & ASSUMPTIONS

As a framework for planning and support for decisionmaking, four Water Budget Scenarios shown in Table 7 and Table 8 illustrate potential combinations of water supply and water demand allocation to existing and potential new neighbourhoods in the Water Service Area.

The Water Budget Scenarios consider the range of potential community growth that could be considered within Lantzville within the time horizon of the 2017 OCP Review, providing a planning-level projection of water demands over the next 20 years.

The potential water demand is based on the higher range of potential water connections to existing and new growth in the Water Service Area.

Demand budgeting is based on Maximum Day Demand – the day of the year is which most water is used (typically during the summer). The Design Standard outlined in **Section 4** of the Water Master Plan and used in the Water Budget Scenarios are based on the Maximum Day Demand.

The intent is to illustrate if and how maximum demands can be met, rather than to imply that this level of growth will be actually supported by the community or approved by Council. Decisions about water supply improvements or additions and extensions of community water service to existing or new parcels will be made incrementally, and may evolve from one Scenario to the next.

Within this context of uncertainty, an Adaptive Management approach is warranted. The Water Master Plan and this water budgeting review strive to provide clarity around the trade-offs and effects of potential changes in supply or demand. The Adaptive Management approach will require a review of water budgeting when each major change is considered, including changes in supply, significant addition of connections for existing or new parcels, changes to the Design Standard, or changes to water conservation approaches. It will also require ongoing monitoring and analysis of actual supply and demands for comparison with the scenario predictions of the Water Master Plan. Assumptions for the scenarios include:

- Water supply for Foothills is supplied by the developer and is not included in the calculations.
- All existing water connections will be maintained, but with water allocations to these connections based on the proposed Design Standard outlined in Section 4 of this plan.
- New water connections to both existing unserviced and proposed new parcels will be based on the proposed Design Standard outlined in *Section 4* of this plan.
- Where community water supply to new neighbourhoods or units is proposed, the water supply allowance is in the maximum range of anticipated units within the term of the 2017 OCP Update (approx. 20 years). This allowance also includes estimates of the proportion of singlefamily, multiple-family, and secondary or senior suite in each neighbourhood.
- For planning purposes, water budgeting considers cumulative demand at the end of a 20-year period. The maximum 2017 OCP build-out may or may not occur within that period – it is common that OCP allowances for growth of housing development are not achieved within the OCP time frame.
- An allocation of 15 m<sup>3</sup>/day is provided for indoor potable water use at Aspengrove School. It is recommended that outdoor use (including playing fields) be from non-community sources (e.g. rainfall capture and well water combinations).
- Smaller infill development in areas that are beyond Phase E sewer extension (refer to Map No. 8 of the 2005 OCP) is not assumed in the scenarios, as these areas are not anticipated to subdivide in the absence of sewer connection. Larger lots in these areas are considered as having potential for subdivision in the scenarios as they may be subject to developerdriven sewer extension.

## 6.3.4 WATER SCENARIO TABLES

The four scenarios shown are presented in the following two tables:

- Potential Water Supply (Table 7): Identifies potential source of water from existing or new groundwater wells, or under the Lantzville/Nanaimo Water Agreement.
- Potential Water Demand and Allocation (Table 8): Provides approximate allocation of available water to various existing and potential neighbourhoods.

	Potential Available Supply (m³/day)			
Potential Water Supply Source	Scenario A	Scenario B1	Scenario B2	Scenario C
Existing Well Field	3,100	3,100	3,100	3,100
Lantzville/Nanaimo Water Agreement (to service 436 existing units)	-	1,264	1,264	1,264
Lantzville/Nanaimo Water Agreement (to service 50 new units/year for 20 years)	-	2,900	2,900	2,900
New Water Source*	-	-	-	500- 1,000
Total Combined Potential Supply	3,100	7,294	7,294	7,764 - 8,264

Table 7: Potential Water Supply

\* Actual available supply from a potential new water source is unknown at this time. The supply shown in the table suggests the approximate amount that may be necessary to service the potential growth outlined in Scenario C.

Table 8: Potential Water Demand and Allocation

	Allocated % of Total Potential Supply			
Potential Allocation Area	Scenario A	Scenario B1	Scenario B2	Scenario C
Lower Pressure Zone				
Existing Connections	61%	26%	26%	23%
<ul> <li>Existing Unserviced Properties</li> </ul>	1%	1%	0%	1%
New Minor Potential Infill	2%	2%	2%	1%
New Village Area Potential Development	0%	5%	9%	10%
Middle Pressure Zone				
<ul> <li>Existing Unserviced Properties</li> </ul>	15%	6%	6%	6%
Clark / Ronald / Hase Potential Infill	0%	0%	0%	4%
<ul> <li>Other Potential Infill</li> </ul>	0%	0%	0%	1%
Upper Pressure Zone				
Existing Connections	20%	9%	9%	8%
<ul> <li>Existing Unserviced Properties</li> </ul>	1%	11%	8%	10%
<ul> <li>New Village Southeast Potential Development</li> </ul>	0%	7%	7%	6%
► Fernmar Potential Infill	0%	2%	2%	2%
Ronald/Ware Road Potential Infill	0%	1%	1%	1%
<ul> <li>Winds East (Superior Rd) Potential Infill</li> </ul>	0%	9%	9%	8%
Lantzville East (Care Precinct)	0%	3%	3%	3%
<ul> <li>Other Potential Infill</li> </ul>	0%	7%	7%	6%
Unallocated Potential Water Supply	0%	11%	11%	10%

## 6.3.5 WATER BUDGETING SCENARIOS

Each scenario has a conceptual approach, first for water supply, and then for demand and allocation of this supply.

## SCENARIO A

### Water Supply

- From existing well field only, assuming that the updated well field rating of 3,100 m<sup>3</sup>/day identified in the March 2017 report (LHC, 2017) is validated upon further well field testing in the summer months
- ► Cumulatively 3,100 m³/day

### Water Demand and Allocation

Refer to Figure 20 for approximate extents of potential allocation

- ▶ All 885 existing water connections are maintained
- Connections to existing unserviced properties within the Water Service Area are given priority. However, there is insufficient supply to service all areas. Based on public input (see Section 5) and extent of existing serviced areas, priority unserviced neighbourhoods for water service extension include:
  - » AW: Clark Drive Area
- » FW: Fernmar Road Area
- Tentatively, community water supply may not sufficient for extension to the following existing unserviced neighbourhoods:
  - » HW-1: Winds Residential
- » HW-2: Winds Estates

» GW: Aats Road

- » BW: Owen Road
- » IW: Bayview
- No new growth is supported, other than minor infill in existing serviced areas (e.g. up to 20 units in Lower Lantzville)



Figure 20: Scenario A Potential Servicing Allocation

## SCENARIO B1

## Water Supply

- From two sources:
  - » Existing well field, assuming that the updated well field rating of 3,100 m<sup>3</sup>/day identified in the March 2017 report (LHC, 2017) is validated upon further well field testing in the summer months
  - » Implementation of the Lantzville/Nanaimo Water Agreement which may provide 436 connections (1,264 m<sup>3</sup>/ day) for existing properties, plus 50 new connections per year over 20 years at 2.9 m<sup>3</sup>/connection (2,900 m<sup>3</sup>/day after 20 years) in the Upper Pressure Zone
- Cumulatively 7,264 m³/day, of which 2,900 m³/day is made available incrementally over 20 years for new development

## Water Demand and Allocation

Refer to Figure 21 for approximate extents of potential allocation

- All 885 existing water connections are maintained
- Water supply is available for all existing parcels in unserviced neighbourhoods within the Water Service Area. Water service extensions would depend on Local Area Service financing approval
- Water is available for minor infill in existing serviced areas (e.g. up to 20 units in Lower Lantzville)
- Under the Lantzville/Nanaimo Water Agreement, water for new development in the Upper Pressure Zone is available at a rate of 50 units/year, providing adequate water supply to service maximum potential OCP build-out in Upper Lantzville over a 20-year time period, with approximately 11% of this water unallocated
- Water for new development in the Village Area of Lower Lantzville would be from the existing well field, and the supply could cover about 45-55% of the maximum potential OCP build-out for the Village Area anticipated in the 2017 OCP



Figure 21: Scenario B1 Potential Servicing Allocation

## SCENARIO B2

#### Water Supply

Sources and supply identical to Scenario B1 (refer to previous page)

#### Water Demand and Allocation

Refer to Figure 22 for approximate extents of potential allocation

- Similar to B1, but shifting priorities so that more of the anticipated Village units are provided with water supply, while some of the outlying existing Water Service Area neighbourhoods are not allocated until new sources are provided
- ▶ All 885 existing water connections are maintained
- Water supply is available for existing parcels in the following Phase 1 and Phase 2 unserviced neighbourhoods within the Water Service Area (see Figure 18 on page 39), pending Local Area Service financing approval:
  - » AW: Clark Drive Area
- » HW-1: Winds Residential
- » FW: Fernmar Road Area » HW-2: Winds Estate
- Water supply may not sufficient for extension to the following Phase 2 existing unserviced neighbourhoods within the Water Service Area (see Figure 18 on page 39):
  - » BW: Owen Road
- » IW: Bayview
- » GW: Aats Road
- Water is available for minor infill in existing serviced areas (e.g. up to 20 units in Lower Lantzville)
- Under the Lantzville/Nanaimo Water Agreement, water for new development in the Upper Pressure Zone is available at a rate of 50 units/year, providing adequate water supply to service maximum potential OCP build-out in Upper Lantzville over a 20-year time period, with approximately 12% of this water unallocated
- Water for most Village development in Lower Lantzville would be from the existing well field, and the supply could cover about 75% of the maximum Village units anticipated in the 2017 OCP Update



Figure 22: Scenario B2 Potential Servicing Allocation

## SCENARIO C

## Water Supply

- From three sources:
  - » Existing well field, assuming that the updated well field rating of 3,100 m<sup>3</sup>/day identified in the March 2017 report (LHC, 2017) is validated upon further well field testing in the summer months
  - » Implementation of the Lantzville/Nanaimo Water Agreement which may provide 436 connections (1,264 m<sup>3</sup>/ day) for existing properties, plus 50 new connections per year over 20 years at 2.9 m<sup>3</sup>/connection (2,900 m<sup>3</sup>/day after 20 years) in the Upper Pressure Zone
  - » Allowance for a new ground water supply connected to the community water system (900 1,000 m<sup>3</sup>/day)
- Cumulatively 8,164 to 8,264 m<sup>3</sup>/day of which 2,900 m<sup>3</sup>/day is available incrementally over 20 years for new development

## Water Demand and Allocation

Refer to Figure 23 for approximate extents of potential allocation

- Scenario C would provide adequate community water supply for all existing and the maximum number of proposed units in the 2017 OCP Update
- All 885 existing water connections are maintained
- Water supply is available for all unserviced neighbourhoods within the Water Service Area. Water service extensions would depend on Local Area Service financing approval
- Water is available for minor infill in existing serviced areas (e.g. up to 20 units in Lower Lantzville)
- Under the Lantzville/Nanaimo Water Agreement, water for new development in the Upper Pressure Zone is available at a rate of 50 units/year, providing adequate water supply to service maximum potential OCP build-out in Upper Lantzville over a 20-year time period, with an approximate 10% of this water unallocated
- Water for Village development in Lower Lantzville would be from the existing well field, and the supply could cover 100% of the maximum Village units anticipated in the 2017 OCP Update



Figure 23: Scenario C Potential Servicing Allocation

### 6.3.6 COMPARISON OF SCENARIOS

The following broad summary statements can be observed in the scenarios:

- Scenario A does not provide a water budget for all existing parcels in the Water Service Area and allows for no new growth.
- Scenario C does provide a water budget for all existing parcels in the Water Service Area, plus all potential growth that could be considered under the OCP Update.
- Scenarios B1 and B2 provide a water budget for <u>either/or</u> a large portion of build-out of the Village or potential future water extension to all existing parcels in the Water Service Area, but does not have budget to fully supply both.

Because the Lantzville/Nanaimo Water Agreement supplies water to new growth in the Upper Pressure Zone, growth to potential future build-out in these areas would not be impeded by lack of groundwater supply; however, growth in these areas would be managed at a rate of 50 units/year per the agreement.

It is possible that new water supply, if early in the 20year period, may facilitate more rapid completion of some new development in the Upper Pressure and Middle Pressure Zones, likely in or near those parcels from where the water is supplied related to providing proven wells. Conversely, providing new water supply could be a condition of development of those properties shown on the Phasing Map (Figure 18 on page 39) as 'Development Driven', and also, perhaps, a development condition for some Village area rezonings or subdivision.

#### 6.3.7 SUMMARY

The Water Budget Scenarios provide a high level comparison of trade-offs to expand and maintain a resilient water service in Lantzville. An Adaptive Management approach is recommended to address the many uncertainties that will affect future water budgeting and should consider:

- Monitored performance of existing well field and aquifer
- Monitored water use data for various land use types and consideration for an updated Design Standard based on data
- Amount of alternate or improved groundwater supply
- Additional proven water conservation practices that lead to a sustained lower demand across the community
- Some existing units in Lantzville not requesting community water supply
- Less growth than the build-out anticipated in the 2017 OCP Update
- Changes to conditions of the Lantzville/Nanaimo Water Agreement
- Other unforeseen circumstances

A ongoing review of water budget demand and allocation is warranted. As a part of rezoning consideration, a report on implications to the water budget should be considered. A periodic major review of water budget demand and allocation should be undertaken in tandem with long-term capital budgeting and major water projects, and at least once in each five year period.

For purposes of long-term planning for the next 20 year time frame and beyond, it is suggested that provisions be made to implement water supply infrastructure that could accommodate Scenario C to be prepared for the broadest range of potential circumstances. Pursuing water supply under Scenario C, while consistent with 2005 OCP policies, is not intended to fetter the discretion of future Councils and the community to accept or deny any given rezoning or development application based on merits at the time.

# 6.4 WATER BUDGETING RECOMMENDATIONS

- 1. Complete a reassessment and well rating for the well field in the summer months (e.g., August), as recommended by the hydrogeologist report (LHC, 2017).
- 2. Review and update water budgets after completion of the recommended well field assessment.
- 3. Prepare and implement a well head protection plan for Lantzville's well field to ensure the existing groundwater source remains protected for the future.
- 4. Consider pursuing amendment to the Lantzville/ Nanaimo Water Agreement to support allocation of <u>new</u> connections that allow the servicing of both existing and <u>new</u> development. If amendment is not possible, consider alternative options to expand services to all existing development in Upper Lantzville.
- 5. Plan and design water supply, storage, and distribution infrastructure to potentially accommodate Scenario C to be prepared for the broadest range of potential circumstances, recognizing implementation will be incremental and responsive to community evolution.

- 6. Adopt an Adaptive Management approach to address future changes that may affect the water budget.
- Complete a reassessment of potential future water demands on a minimum five-year basis. Annual water use records should be compared to projections and both population and per capita use projections should be recalculated to update supply and demand figures. This should occur in tandem with capital budget planning reviews (see Section 8) to identify and incorporate necessary capital improvements.
- 8. When new development proposals are considered, complete analysis and reporting on the water budget to confirm potential implications of the development.



# 7 | WATER CONSERVATION

An average Lantzville water user consumes approximately 320 litres per average day. This is at the low end of consumption rates reported by Vancouver Island Communities, where the average is around 700 litres per person per day. Given Lantzville's water supply limitations, maintaining these conservation efforts over the long-term will continue to be important.

# 6.5 WATER RATES

Lantzville's high level of water conservation is partially attributable to the tiered water rate system that the District employs which was first introduced as a bylaw in 2003 and most recently updated in 2016. The tiered rate structure means that if a user conserves water and stays within the first tier, they pay a lower water rate. Once a user surpasses this tier, the amount paid per cubic meter of water used increases as outlined in Table 9.

Tier	Threshold (per quarter / 3 months)	Rate Paid
1	First 75 m <sup>3</sup>	\$64.63
2	Each additional m <sup>3</sup> between 76 m <sup>3</sup> and 100 m <sup>3</sup>	\$1.41
3	Each additional m <sup>3</sup> between 101 m <sup>3</sup> and 125 m <sup>3</sup>	\$1.72
4	Each additional m <sup>3</sup> between 126 m <sup>3</sup> and 150 m <sup>3</sup>	\$2.29
5	Each additional m <sup>3</sup> over 151 m <sup>3</sup>	\$2.92

#### Table 9: Current Lantzville Water Rates

To understand people's perceptions about the current community water rate structure participants were asked in Questionnaire #1 about their understanding and support for the current tiered rate structure. Figure 24 suggests that the majority of residents on community water understand the current rate structure and Figure 25 suggests the majority of community water users support the existing tiered rate structure, with some mixed opinions that the rates are either too high or too low.



Figure 24: Awareness of Tiered Rate Structure



Figure 25: Support for Existing Rate Structure

## 6.6 RESIDENT WATER CONSERVATION ACTIVITIES

Lantzville residents, unlike many other residents in Canada, have long understood the implications of scarcity of supply and have recognized that water is not a limitless resource. Continually seeking ways to maintain levels of service, while decreasing per capita demand helps slow the need for major capital investments and helps maintain a resilient supply.

During the initial input, participants were also asked their level of participation in common water conservation activities. As shown in Figure 26, Lantzville residents participate heavily in a wide range of water conservation activities. Generally, indoor conservation actions, such us using low-flow fixtures and practicing low water use behaviours are very high. Input suggest that water use conservation activities for outdoor water use are not as broadly adopted at this point. Because outdoor water use can contribute significantly to a community's overall and maximum day water use, opportunities may exist to further encourage outdoor water savings.

With advances in technology and interest worldwide in water conservation, future residences will continue to be designed to use less water. Over time, it can be anticipated that household renovation, appliance replacement, and water technologies will continue to support per capita water use reduction, although improvements may not be as significant in Lantzville given the existing high rate of conservation.



Figure 26: Lantzville Resident Participation in Water Conservation Activities

# 6.7 COMMUNITY WATER CONSERVATION INITIATIVES

## 6.7.1 CURRENT COMMUNITY WATER CONSERVATION INITIATIVES

In addition to Water Rates, the District of Lantzville employs a number of water conservation initiatives that encourage residents to use water wisely. Key programs include:

- Water Restrictions: Lantzville, along with all water purveyors in the Regional District of Nanaimo, has adopted consistently defined water restriction stages. The District manages when each stage is implemented and communicates the restrictions to residents.
- Education: Lantzville provides water conservation information for residents through the District's <u>Water website</u> (available at <u>lantzville.ca</u>). Educational materials provide water conservation advice for personal water use and for low impact development. Continuing to provide up-to-date information about water use and conservation in Lantzville will support maintaining a water-efficient community.
- Metering: Lantzville's community water system is fully metered. Metered systems have been shown to significantly reduce water consumption by raising individual homeowner awareness of water consumption. In addition, Lantzville's existing metering system gathers data on water use by each connection in the community. This system provides opportunity for the District to identify potential leaks in the system by flagging excessive consumption or significant changes in water use. In these cases, the District will attempt to notify consumers to indicate there may be a leak.

Rainwater Harvesting Incentive Program: A Rainwater Harvesting Incentive Program is available to all residential property owners in the Regional District of Nanaimo who install or update a rainwater harvesting system in existing or new homes.

## 6.7.2 PUBLIC INPUT ON POTENTIAL COMMUNITY CONSERVATION INITIATIVES

During the Kitchen Table Meetings and online input opportunities, participants were asked for feedback on various water conservation opportunities that may warrant future consideration in Lantzville. Table 10 on the following page summarizes general indications of the level of importance participants identified for various initiatives.

Table 10: Potential Water Conservation Initiatives

Water Conservation Initiative	Very Important	Mod. Important	Not Important
Consider increasing the overall water rates to encourage property owners to reduce water consumption.	18%	34%	47%
Consider increasing the higher tier water rates to encourage property owners to reduce water consumption.	29%	58%	21%
Provide educational materials to residents to help them implement improvements to their homes, properties, and behaviour that support water conservation.	66%	32%	11%
Develop policy that requires new development to incorporate water- saving elements such as low-flow fixtures and low water-use landscape areas / low volume irrigation (if used).	71%	29%	0%
Develop policy that encourages water users that are connected to community water but have existing wells, to use well water for outdoor (non-potable uses) and community water for indoor (potable uses) only.	74%	26%	11%
Increase incentives / support for water savings initiatives (e.g., rainwater harvesting and re-use).	42%	37%	13%
Develop stricter water restrictions for outdoor watering during the summer months.	39%	26%	37%

The feedback suggests that further increases to the water rates at the current time may be less desirable than encouraging voluntary water conservation through enhanced development requirements and education.

Public input also identified additional opportunities that may warrant future consideration such as encouraging conversion of existing septic tanks for rainwater storage after a property connects to the community sewer system. This practice is used in other communities and precedents likely exist to support the creation of policy and practices that support safe conversions.

## 6.8 WATER CONSERVATION RECOMMENDATIONS

- 1. Maintain the tiered rate structure as recently updated and complete reviews/updates at minimum every five years to confirm if water rates should be increased to encourage water conservation and ensure adequate funding for ongoing maintenance/ renewal of system infrastructure.
- Consider requiring all new development under development permit to incorporate water saving elements such as low-flow fixtures and low wateruse landscape areas and to provide a water budget as a component of their development permit application to calculate proposed water use.
- Continue to develop or partner on new educational materials and programs that encourage water conservation approaches for residential land owners, particularly as new residents enter the community.

- 4. Continue to support the Rainwater Harvesting Incentive Program and consider new incentives and programs that encourage residents to make water smart choices.
- 5. Consider encouraging water users that are connected to community water but have existing wells to use well water for outdoor (non-potable uses), provided there are no impacts to the District's groundwater sources.
- Investigate and consider implementing a septic storage conversion program that encourages or supports homeowners transitioning existing septic tanks to non-potable water storage for outdoor water use after municipal sewer is extended.



# 8 | CAPITAL IMPROVEMENTS

As a community evolves, infrastructure must be renewed or created to address community needs. The Water Master Plan outlines scenarios that could occur over the next 20 years of Lantzville's evolution. Capital improvements for the water system are required to support this evolution, recognizing upgrades will be phased over time based on funding and Council direction.

# 8.1 RECOMMENDED CAPITAL IMPROVEMENTS

Water system planning entails looking ahead and determining what expansion in capacity may be required to meet future demands. This may entail the construction of additional watermains or the replacement of older pipes. It may also involve expansion of water supply and reservoir capacity at an existing site or construction of new reservoirs. System planning also involves consideration of the remaining life of the various components and when replacement or remediation will be required.

A water supply and distribution system is comprised of many components. The lifespan of each component in the system can vary – some smaller components have a useful life as short as 15 years, while larger infrastructure like reservoirs will last well over 50 years. Large diameter water distribution mains typically have an expected life of 40 to 80 years.

Given this long life of system components, it is important to plan early to develop a system that meets current and future needs of the community. This will help ensure that components are correctly sited and sized. Planning will also support system upgrades as new technologies emerge.

In 2015, Koers & Associates Engineering Ltd. developed the Water Supply & Distribution System Study that identified a number of existing anticipated upgrades to the community water system. With the completion of the Water Master Plan, potential upgrades identified in the 2015 Study have been updated and are summarized in Table 11 to reflect long-term potential planning directions identified through this process.

The following capital improvements are recommended for planning for the next 20 years to accommodate existing properties and potential growth identified in the 2017 OCP Update. While the improvements would be phased incrementally and reviewed and refined as needs are confirmed, long-range planning helps ensure short-term investments will support a range of longterm scenarios.

#### 8.1.1 SUMMARY OF RECOMMENDED CAPITAL IMPROVEMENTS

The following summary discusses the capital projects outlined in Table 11 and graphically shown in Figure 27.

#### 1 WATER SUPPLY CAPACITY IMPROVEMENTS

#### 1.1 Reconnect Well #5

In 2002/2003 Well #5 was abandoned due to its interference with Well #6. With the replacement of Well #6 by Well #6a, Well #5 was retested and confirmed to provide benefit when running with the new well. Well upgrades and reconnection are recommended to increase the capacity of the well field.

#### **1.2 Secure Groundwater Licenses for Wells**

The Water Sustainability Act passed in May 2014 requires municipalities to obtain a license from the provincial government for the extraction of water from the ground. The license requires payment of a one-time application fee of \$5,000, in addition to an annual fee of \$2.25/1,000 m<sup>3</sup>) of water extracted. Based on recent annual water use of about 250,000 m<sup>3</sup>/year annual fees would be approximately \$565.

### 1.3 Implement the Lantzville/Nanaimo Water Agreement

Construction of the Lantzville/Nanaimo physical water connection will be completed in 2017. If Council decides to proceed with commencement of the agreement, there is a requirement to pay a one-time connection fee for the existing Upper Pressure Zone residences connected to community water that will be serviced by Nanaimo water. This fee is based on the agreement's connection fee of \$5,912.26 per single-family dwelling unit for 225 units, totaling approximately \$1,330,000.

# 1.4 Pursue Identification of a New Groundwater Source

The water budget models (see Section 6) suggest there may be insufficient long-term water supply to fulfill potential long-term growth of the OCP Update, due to limited existing groundwater supply and limitations of the Lantzville/Nanaimo Water Agreement.

Identifying future groundwater sources would increase resilience of the system. It is anticipated new sources would be negotiated as part of future development.

#### 2 SYSTEM STORAGE IMPROVEMENTS

#### 2.1 New Reservoir

The existing Aulds Road reservoir was built in 1974 and is undersized for both existing and potential future storage volume requirements. The current top water level of the reservoir, 143.6 m geodetic results in a static operating pressure below acceptable design minimums for a small portion of properties.

A new reservoir in the Foothills with a top water elevation of 158 m geodetic is proposed to replace the function of the Aulds Road reservoir and provide expanded storage capacity. The reservoir would be a two cell reservoir that allows for separation of storage between water from Nanaimo that will service the Upper Pressure Zone, and Lantzville well field water that would be used in the Middle Pressure Zone, if needed.

The cost estimate is based on construction of an appropriately-sized two-cell reservoir and includes watermain connection to the Ware Road Reservoir and Nanaimo Water Connection.

## 3 FIRE FLOW IMPROVEMENT PROJECTS (COMMERCIAL, INSTITUTIONAL, INDUSTRIAL)

### 3.1 - 3.8 Watermain Upgrades

The 2015 Water Supply & Distribution Study identified several watermain upgrades to improve firefighting capabilities in and around the Village Core area and along adjacent areas in the Lower Pressure Zone. Many of these projects support replacement of the District's existing asbestos cement watermains. Priorities for these upgrades include the eight following locations:

- Mart Rd and Industrial Rd (Metro to Harby Rd East)
- Peterson Rd (Lynn to Lantzville)
- Lantzville Rd (Peterson to Harper)
- Harby Rd East (Peterson to Joy)
- Joy Way and Rossiter Rd (Peterson to Lancewood)
- Millard Dr (Peterson to Lancewood)
- Lynn Dr (Peterson to Lancewood)
- Lancewood Ave (Rossiter to Lynn)

# 4 FIRE FLOW IMPROVEMENT PROJECTS (RESIDENTIAL)

#### 4.1 Replace Limited Capacity Fire Hydrants

The 2015 Water Supply & Distribution Study recommended that the District continue with its replacement program of the older fire hydrants that have limited firefighting capabilities. Eight older hydrants were identified in the Lower Pressure Zone for replacement consideration:

- No. 23 Huddlestone Rd park entrance
- No. 54 7311 Lynn Rd
- No. 57 7305 Millard Rd
- No. 59 7339 Rossiter Rd
- ▶ No. 60 7299 Rossiter Rd
- ▶ No. 61 7292 Harby Rd East
- No. 62 7340 Harby Rd East
- ▶ No. 72 7032 Leland Rd

#### 4.2 - 4.9 Watermain Upgrades

The 2015 Water Supply & Distribution Study identified a number of watermain upgrades to improve firefighting capabilities in residential areas. In addition, many of these projects support replacement of the District's existing asbestos cement watermains. Priorities for these upgrades include the eight following locations:

- Lantzville Rd (east and west of Superior Rd)
- Huddlestone Rd
- Harper Rd
- ► Hall Rd
- Saxon Cross
- Forest Turn
- Clark Crescent
- ► Geisler Pl & Chataway Pl

### **5 OTHER WATER IMPROVEMENT PROJECTS**

#### **5.1 Asbestos Cement Main Replacement**

The 2015 Water Supply & Distribution Study recommended the District continue with its AC main renewal/replacement program, preferably in advance of any proposed road rehabilitation requirements within the area. With the completion of priorities noted above, there will be approximately 9 km of AC main remaining in the District. A budget of \$340,000/year would allow for replacement of all remaining AC pipe over 15 years.

#### 5.2 Looping through Future Development

There are several locations where future development may offer the ability to construct addition looping within the water system which will serve to strengthen the distribution system and improve fire flows throughout the water service area. As part of future development proposals, the District should review and require looping as part of development.

# 5.3 Relocation of PRV on Lantzville Rd to Ware Rd (TBD)

The 2015 Water Supply & Distribution Study recommends relocation of the PRV to facilitate the development of the lands in the Ware Rd/Lantzville Rd area.

## 8.1.2 CAPITAL COST SUMMARY

Table 11 on the following page summarizes the above projects in a capital cost summary table provided for planning and budgeting purposes. Detailed design development and confirmation of costs will be required for all projects prior to implementation. Cost estimates are derived from Koers & Associates Engineering Ltd. inhouse construction cost data for watermain construction projects in the mid-Vancouver Island area. All costs are as of June 2017 when the ENR Construction Cost index was 10,699. Costs for infrastructure can vary widely depending on site constraints, design, market forces, and other variables.

The cost estimates are based on Class 'D' (feasibility study) estimates, made without preliminary design input. The cost estimates include a 25% allowance for legal, construction, financial, administration, and engineering costs.

Suggested time frames for implementation are included in the table to provide planning horizons for implementation:

- Immediate: 1 to 2 year time frame
- Short: 2 to 5 year time frame
- Medium: 6 to 10 year time frame
- Long: Beyond 10 year time frame
- Ongoing: No defined time frame / implementation based on community evolution

Table 11: Capital Improvements Summary Table

Ref. No.	Description	Quantity	Class 'D' Cost Estimate (2017 dollars, excl. GST)	Suggested Time Frame
1. W	ATER SUPPLY CAPACITY IMPROVEMENTS			
1.1	Reconnect Well #5	1	\$50,000	Immediate
1.2	Secure Groundwater Licenses for each Well	n/a	\$6,500	Short
1.3	Implement the Lantzville/Nanaimo Water Agreement	n/a	\$1,330,000 (connection fee)	Short
1.4	Pursue identification of a new groundwater source through future development (not on map)	1	By Development	TBD
2. SY	STEM STORAGE IMPROVEMENTS			
2.1	New Reservoir – New dual reservoir with a 158 m top water elevation to service the Upper and Middle Pressure Zones	1	\$900,000- \$1,000,000	Short
3. FIF	RE FLOW IMPROVEMENT PROJECTS (COMMERCIAL, INSTIT	TUTIONAL, INDUSTRIAL	. BENEFIT)	
3.1	Watermain Upgrade – Mart Rd and Industrial Rd (Metro to Harby Rd East)	175m of 200mm dia. 475m of 250mm dia.	\$450,000	
3.2	Watermain Upgrade – Peterson Rd (Lynn to Lantzville)	300m of 250mm dia.	\$240,000	
3.3	Watermain Upgrade – Lantzville Rd (Peterson to Harper)	450m of 250mm dia.	\$330,000	
3.4	Watermain Upgrade – Harby Rd East (Peterson to Joy)	175m of 250mm dia.	\$125,000	Ongoing in Order
3.5	Watermain Upgrade – Joy Way and Rossiter Rd (Peterson to Lancewood)	425m of 200mm dia.	\$255,000	of Priority Shown
3.6	Watermain Upgrade – Millard Dr (Peterson to Lancewood)	325m of 200mm dia.	\$195,000	
3.7	Watermain Upgrade – Lynn Dr (Peterson to Lancewood)	325m of 200mm dia.	\$195,000	
3.8	Watermain Upgrade – Lancewood Ave (Rossiter to Lynn)	250m of 200mm dia.	\$150,000	
4. FI	RE FLOW IMPROVEMENT PROJECTS (RESIDENTIAL AREA B	ENEFIT)		
4.1	Replace Limited Capacity Hydrants (not on map)	8 @ \$3,700 ea.	\$30,000	
4.2	Watermain Upgrade – Lantzville Rd (east and west of Superior)	1,500m of 200mm dia.	\$900,000	
4.3	Watermain Upgrade – Huddlestone Rd	175m of 200mm dia.	\$105,000	
4.4	Watermain Upgrade – Harper Rd	200m of 200mm dia.	\$120,000	Ongoing
4.5	Watermain Upgrade – Hall Rd	150m of 200mm dia.	\$90,000	- In Order of Priority
4.6	Watermain Upgrade – Saxon Cross	150m of 150mm dia.	\$80,000	Shown
4.7	Watermain Upgrade – Forest Turn	150m of 150mm dia.	\$80,000	
4.8	Watermain Upgrade – Clark Crescent	425m of 200mm dia. 100m of 150mm dia.	\$310,000	
4.9	Watermain Upgrade – Geisler Pl and Chataway Pl	275m of 150mm dia.	\$150,000	
5. OT	HER WATER IMPROVEMENT PROJECTS			
5.1	Asbestos Cement Main Replacement (10- 12.5 km) (not shown on map)	600m/year for 15 years (\$360,000/yr)	\$5,400,000	Ongoing for 15 years
5.2	Watermain Looping Based on Future Development	As Required	By Development	Ongoing
5.3	Relocate PRV on Lantzville Rd to Ware Rd (TBD)	1	By Development	TBD

## DISTRICT OF LANTZVILLE - WATER MASTER PLAN 20-YEAR CAPITAL PROJECTS SUMMARY



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## 8.2 FINANCIAL MANAGEMENT

Lantzville's Water Improvement District began in the 1950s to fund early water infrastructure. This infrastructure has evolved over the past 70 years into the existing water system. In previous years, senior government programs have played a significant role in supporting funding of infrastructure in small communities. Trends suggest that funding through senior government programs may be uncertain, although it remains important for Lantzville to position itself to take advantage of senior government funding as available.

As this infrastructure ages and delivery standards evolve, funding will be needed to maintain or replace components of the water system. The water service industry is moving towards full cost accounting to understand the true cost of servicing the customer and ensuring future revenue streams match these costs. The "full cost" not only includes current capital costs or debt and operating and maintenance costs, but also the costs to maintain the infrastructure in a sustainable manner. Financial planning to meet future water supply needs in concert with managing existing infrastructure will be key to long-term resiliency.

It can be anticipated that Lantzville's capital investments will be funding through a combined strategy that includes:

- Senior Government Grants for major infrastructure projects, with the recognition that grant funding may not be a guaranteed source of future funding.
- Water Rates that cover not only water use, but also generate sufficient funding for ongoing maintenance and renewal of the system.
- Development cost chargers and other development funding for capital works driven by capacity increases needed to service growth. The District has an existing Development Cost Charges (DCC) program which should be reviewed from time to time to ensure the revenue calculations are reflective of expected construction costs and fully account for the growth share of infrastructure costs.

# 8.3 CAPITAL IMPROVEMENT & FUNDING RECOMMENDATIONS

- 1. Continue planning and development of a new reservoir in the Foothills (Table 11, Item 2.1) to provide sufficient water storage to service the Upper Pressure Zone and Proposed Middle Pressure Zone (if required).
- 2. Undertake phased implementation of the capital recommendations identified in Table 11.
- 3. Review and update capital recommendations every five years at minimum, considering changes in system supply or demand (see Section 6) and updated cost information.
- 4. Develop and implement an Asset Management Plan targeted at maintaining water service infrastructure over time.

- 5. Use full cost accounting for the water services system ensuring revenue generated is sufficient to fund system operations, management, and growth.
- 6. Renew and replace aging infrastructure to maintain required levels of service based on risk analyses (including seismic risk) and cost-benefit priorities.
- Continue to pursue senior government grants to supplement funding for infrastructure projects, while not relying on these funds.
- 8. Review and update the water service DCC program at minimum every five years to ensure the revenue calculations are reflective of expected construction costs and fully account the growth capacity share of the infrastructure.

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# 9 | SUMMARY

Over the years, the District of Lantzville has been working to address water supply questions. Emerging options have been identified that could support expansion of the community water system. Implementing changes to the water system should occur thoughtfully and be monitored carefully to support the evolution and maintenance of a resilient system for the future.

# 9.1 SUMMARY OF RECOMMENDATIONS

The preceding sections of the Water Master Plan outline recommendations intended to assist Lantzville in achieving community goals related to water supply and distribution, including:

- Allowing potential for access to safe drinking water for all properties within the Water Service Area
- Creating a sustainable future water supply
- Developing a cost effective water system
- Continuing to encourage responsible community water use

Achieving these goals will require incremental capital improvements, alongside planning and policy that monitors and updates directions as the community evolves. Table 12 on the following page summarizes the compiled list of recommendations identified in the previous sections. The recommendations are provided for Council to consider in the context of overall community planning.

It is important that an adaptive management approach is taken when implementing the recommendations, so that when new opportunities or circumstances arise, Council and staff are able to make informed decisions to support the goals of the community. Table 12: Recommendations Summary

Ref. No.	Description	Recommended Time Frame
SECTIO	ON 4: DESIGN STANDARD RECOMMENDATIONS (p. 17-24)	
4.1	Develop a Water System Service Bylaw that provides guidance on the Design Standard, community water use, and water servicing costs.	Immediate
4.2	Prior to implementing an updated Design Standard, complete recommended capital improvements to increase community water storage (see Recommendation 8.1).	Short
4.3	Complete the emergency connection with the City of Nanaimo to ensure a secure backup is available for emergency situations.	Immediate
4.4	<ul> <li>Consider implementing the following recommended Design Standard for residential properties connected to the District's community water system:</li> <li>Single-Family Residential: 2,800- 3,000 L/day/connection</li> <li>Multiple-Family Residential: 1,080- 1,710 L/day/connection</li> </ul>	Short
4.5	Assess water demands for all industrial, commercial, and institutional development on a case-by-case basis considering proposed activities and engineering best practices.	Ongoing
4.6	Continue ongoing annual monitoring of water use to identify changes in usage patterns and trends. If trends show increased usage patterns, consider updating the Design Standard to reflect current use.	Annual
4.7	Re-rate the well field every five years minimum and consider adjusting the Design Standard if well field performance or water levels drop.	Medium
4.8	Maintain the existing standard of 3,400 L/day/connection for properties not connected to the District's community water system.	Ongoing
4.9	Within ten years, review and update the Design Standard considering actual usage and new trends.	Long
SECTIO	ON 5: WATER SERVICE EXTENSION RECOMMENDATIONS (p. 25-42)	
5.1	Prior to implementing water service extension to existing neighbourhoods, complete recommended capital improvements to increase community water storage (see Recommendation 8.1).	Short
5.2	Maintain the Water Service Area identified in the 2005 Official Community Plan.	Ongoing
5.3	Upon completion of infrastructure updates, consider allowing unserviced properties within areas where water service infrastructure already exists to apply to connect to the community water system on a first come first serve basis.	Short
5.4	Budget sufficient water supply to allow future servicing of the seven existing unserviced neighbourhoods (AW, BW, FW, GW, HW-1, HW-2, IW) within the Water Service Area. Release of this water budget may warrant consideration in the medium- to long-term if the neighbourhood does not support expansion and other priorities are identified by Council.	Ongoing
5.5	<ul> <li>Consider establishing Local Area Services in the short- to medium-term for the following Phase 1 Service Expansion Neighbourhoods shown on Figure 18 which are adjacent to existing water service lines, subject to approval by current residents:</li> <li>AW: Clark Drive Area</li> <li>FW: Fernmar Road Area</li> </ul>	Short
Ref. No.	Description	Recommended Time Frame
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5.6	Monitor development potential that could reduce the water service extension costs for the Phase 1 Service Expansion Neighbourhood HW-1: Winds Residential. If, in five years development is not anticipated or neighbourhood residents bring forward a petition signed by at least 50% of neighbourhood residents representing at least 50% of land value, consider establishing a Local Area Service for HW-1 to pursue water extension in the absence of new development, subject to approval by current residents.	Medium
5.7	<ul> <li>When Phase 1 water service extensions are complete, reassess neighbourhood opinions about extending water services to the following Phase 2 Expansion Neighbourhoods shown on Figure 18:</li> <li>BW: Owen Road Area</li> <li>HW-2: Winds Estate Residential</li> <li>GW: Aats Road Area</li> <li>IW: Bayview</li> <li>Water extension to the Phase 2 Expansion Neighbourhoods may be considered in a shorter time frame if neighbourhood residents bring forward a petition signed by at least 50% of neighbourhood residents representing at least 50% of land value.</li> </ul>	Long
5.8	Areas identified as Development Driven Expansion Areas on Figure 18 may be considered for servicing as part of development approval processes. Where development-driven expansion is being considered, extension design should be developed to support extension to existing neighbourhoods desiring community water.	Ongoing
5.9	No areas outside the Water Service Area have planned water service extension. In some instances, on a case-by-case basis, community water service (for domestic use only) may be extended to existing properties outside the Water Service Area to address health or environmental concerns.	Ongoing
SECTIO	ON 6: WATER BUDGETING RECOMMENDATIONS (p. 43-56)	
6.1	Complete a reassessment and well rating for the well field in the summer months (e.g., August), as recommended by the hydrogeologist report (LHC, 2017).	Immediate
6.2	Review and update water budgets after completion of the recommended well field assessment.	Immediate
6.3	Prepare and implement a well head protection plan for Lantzville's well field to ensure the existing groundwater source remains protected for the future.	Immediate
6.4	Consider pursuing amendment to the Lantzville/Nanaimo Water Agreement to allow some new connections identified in the agreement to service either new or existing development. If amendment is not possible, consider alternative options to expand services to all existing development in Upper Lantzville.	Medium
6.5	Plan and design water supply, storage, and distribution infrastructure to potentially accommodate Scenario C to be prepared for the broadest range of potential circumstances, recognizing implementation will be incremental and responsive to community evolution.	Ongoing
6.6	Adopt an Adaptive Management approach to address future changes that may affect the water budget.	Ongoing
6.7	Complete a reassessment of potential future water demands on a minimum five- year basis. Annual water use records should be compared to projections and both population and per capita use projections should be recalculated to update supply and demand figures. This should occur in tandem with capital budget planning reviews (see Recommendation 8.3) to identify and incorporate necessary capital improvements.	Medium / Ongoing

Ref. No.	Description	Recommended Time Frame	
6.8	When new development proposals are considered, complete analysis and reporting on the water budget to confirm potential implications of the development.	Ongoing	
SECTION 7: WATER CONSERVATION RECOMMENDATIONS (p. 57-60)			
7.1	Maintain the tiered rate structure as recently updated and complete reviews/updates at minimum every five years to confirm if water rates should be increased to encourage water conservation and ensure adequate funding for ongoing maintenance/renewal of system infrastructure.	Medium / Ongoing	
7.2	Consider requiring all new development under development permit to incorporate water saving elements such as low-flow fixtures and low water-use landscape areas and to provide a water budget as a component of their development permit application to calculate proposed water use.	Immediate	
7.3	Continue to develop or partner on new educational materials and programs that encourage water conservation approaches for residential land owners, particularly as new residents enter the community.	Ongoing	
7.4	Continue to support the Rainwater Harvesting Incentive Program and consider new incentives and programs that encourage residents to make water smart choices.	Ongoing	
7.5	Consider encouraging water users that are connected to community water but have existing wells to use well water for outdoor (non-potable uses), provided there are no impacts to the District's groundwater sources.	Ongoing	
7.6	Investigate and consider implementing a septic storage conversion program that encourages or supports homeowners transitioning existing septic tanks to non-potable water storage for outdoor water use after municipal sewer is extended.	Medium	
SECTION 8: CAPITAL IMPROVEMENT & FUNDING RECOMMENDATIONS (p. 61-67)			
8.1	Continue planning and development of a new reservoir in the Foothills (Table 11, Item 2.1) to provide sufficient water storage to service the Upper Pressure Zone and Proposed Middle Pressure Zone (if required).	Short	
8.2	Undertake phased implementation of the capital recommendations identified in Table 11.	Refer to Table 11	
8.3	Review and update capital recommendations every five years at minimum, considering changes in system supply or demand (see Recommendation 6.6) and updated cost information.	Medium	
8.4	Develop and implement an Asset Management Plan targeted at maintaining water service infrastructure over time.	Short	
8.5	Use full cost accounting for the water services system ensuring revenue generated is sufficient to fund system operations, management, and growth.	Ongoing	
8.6	Renew and replace aging infrastructure to maintain required levels of service based on risk analyses (including seismic risk) and cost-benefit priorities.	Ongoing	
8.7	Continue to pursue senior government grants to supplement funding for infrastructure projects, while not relying on these funds.	Ongoing	
8.8	Review and update the water service DCC program at minimum every five years to ensure the revenue calculations are reflective of expected construction costs and fully account the growth capacity share of the infrastructure.	Medium / Ongoing	



## REFERENCES

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**APPENDIX A:** Water Demand Design Standard Review, 2017 Update – Koers & Associates Engineering Ltd.

**APPENDIX B:** Community Input Summary #1 Minetown Day Event & Questionnaire #1

**APPENDIX C:** Community Input Summary #2 Kitchen Table Meetings

**APPENDIX D:** Community-wide Survey Summary Report

**APPENDIX E:** Draft Review Open House Summary Results



## DISTRICT OF LANTZVILLE

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