PLAN IMPLEMENTATION TOOLS FOR RAINWATER MANAGEMENT IN THE COMOX VALLEY ELECTORAL AREAS

PREPARED FOR:
THE COMOX VALLEY REGIONAL DISTRICT

BY JENNA COOK

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PLAN IMPLEMENTATION TOOLS FOR RAINWATER MANAGEMENT IN THE COMOX VALLEY ELECTORAL AREAS

by

JENNA COOK

B.A., University of Victoria, 2010

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DISCLAIMER

The information and recommendations in this report are based on the authors' interpretation and understanding of best available literature on rainwater management and plan implementation tools. This report has been produced with the intention of offering useful information to the Comox Valley Regional District staff to assist with decision-making on how to use plan implementation tools to meet rainwater management objectives. Although the author has attempted to offer the best possible guidance, the use of the information and recommendations in this report are at the sole discretion of the Comox Valley Regional District. It is recommended that legal expertise be consulted during the next steps in selecting a plan implementation tool(s) for rainwater management. The author and the UBC faculty are not liable for any loss or damage resulting from the use of the information and recommendations in this report.

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Comox Valley Regional District:

- Alana Mullaly, Manager of Planning Services
- Kris La Rose, Senior Manager of Water and Wastewater Services
- Alexandra Hitchcock, former Engineering Analyst
- Ryan O'Grady, Manager of Liquid Waste Planning
- Kyla Kay, Engineering Analyst
- Tania Hardy, Senior GIS Analyst

University of British Columbia:

- Jordi Honey-Rosés, Assistant Professor, School of Community and Regional Planning
- Mark Stevens, Associate Professor, School of Community and Regional Planning
- Julie Wilson, Academic Coordinator, Land and Water Systems Program
- Patricia Kendall, Adjunct Professor, School of Community and Regional Planning

Community:

- Nancy Gothard (City of Courtenay)
- Derek Richmond (formerly City of Courtenay)
- Joanne Rees (Village of Cumberland)
- Nick Carello (District of Metchosin)
- Sheila Mackay (District of Metchosin)
- Jeannie Lee (City of Surrey)
- Jeff Moore (Cowichan Valley Regional District)
- Mike Tippet (Cowichan Valley Regional District)
- Sean Tynan (Metro Vancouver Regional District)
- Robert Hicks (Metro Vancouver Regional District)
- David Stapley (Comox Valley Conservation Strategy)
- Jack Minard (Comox Valley Conservation Strategy)
- Sandra Burton (Comox Valley Conservation Strategy)
- Kim Stephens (Partnership for Water Sustainability in B.C.)
- Deb Curran (University of Victoria Environmental Law Centre)
- Jim Dumont (Engineering Consultant)
- Christina Burns (Environmental Consultant)

LIST OF ACRONYMS

Acronym	Definition
BP	Building Permit
CAVI	Convening for Action on Vancouver Island
CVRD	Comox Valley Regional District
DAI	Development Approval Information
DP	Development Permit
DPA	Development Permit Area
EIA	Effective Impervious Area
ILWRMP	Integrated Liquid Waste and Resource Management Plan
IRMP	Integrated Rainwater Management Plan
ISMP	Integrated Stormwater Management Plan
LID	Low Impact Development
MOTI	Ministry of Transportation and Infrastructure
MVRD	Metro Vancouver Regional District
NCP	Neighbourhood Concept Plan
NGO	Non-governmental Organization
OCP	Official Community Plan
RD	Regional District
RGS	Regional Growth Strategy
RSS	Regional Sustainability Strategy
TIA	Total Impervious Area
WBM	Water Balance Model
WBME	Water Balance Model Express

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EXECUTIVE SUMMARY

This research was conducted to help support the Comox Valley Regional District (CVRD) in reaching its rainwater management objectives in the electoral areas. The Comox Valley is facing many challenges, but also opportunities, regarding rainwater management. Development and its associated increase in impervious surfaces, such as buildings and paved areas, frequently results in an increase in rainwater runoff. This often leads to impacts on aquatic ecosystems and downstream properties. The CVRD is already experiencing these impacts, which are likely to increase into the future unless the problem is addressed. The Comox Valley is projected to grow significantly in the coming years and some of the increased housing demand will need to be met in the electoral areas. The CVRD has the opportunity to influence development design before it takes place, mitigating potential future impacts on ecosystems and properties.

The CVRD has taken the first step by prioritizing the improvement of rainwater management in the electoral areas. Building on previously commissioned work on the topic, the focus of this research is on how plan implementation tools could be applied by the CVRD to reach its rainwater management objectives. The report reviews the rural CVRD context, describes how development and watershed management can be integrated, summarizes the CVRD's rainwater management objectives and policies, and discusses plan implementation tools that can be used to support them. It analyzes how the CVRD is currently using the tools and highlights the gaps from a watershed perspective. It also explores how Comox Valley municipalities and leading local governments are using plan implementation tools for rainwater management. Thereafter, a criteria analysis is presented to support the assessment of the effectiveness and appropriateness of different plan implementation tools for rainwater management available to the CVRD. Finally, recommendations are put forth regarding next steps for the CVRD.

Recommendations are grouped into the following:

1. Commit to increasing the CVRD's use of plan implementation tools to manage rainwater
2. Decide which rainwater management plan implementation tool(s) to utilize and develop the tool(s)
3. Implement the rainwater management plan implementation tool(s)
4. Evaluate the performance of the rainwater management plan implementation tool(s) and make adaptations if necessary
5. Concurrently move forward with additional means of improving rainwater management in the CVRD

INTRODUCTION

Introduction

The Comox Valley is a growing region, facing both challenges and opportunities for the future of its watersheds. New development, re-development, and subdivisions, most often result in an increase in impervious surfaces, such as buildings and paved areas, which lead to an increase in rainwater runoff. As a consequence, the Comox Valley has experienced flooding, erosion, slope stability issues, water quality impacts, and property damage.[1] In response, the Comox Valley Regional District (CVRD) has prioritized the improvement of rainwater management in the region. The aim is to ensure mitigation of development impacts on stream health and downstream flooding. CVRD plan objectives and policies are supportive of this; however, the plan implementation tools currently utilized are limited geographically and in their enforceability, significantly reducing their effectiveness. 'Plan implementation tools' refer to the development, regulatory and enforcement tools that are used to translate high level objectives and policies into actions on the ground. This report examines how plan implementation tools could be better applied by the CVRD to reach its rainwater management goals in the electoral areas.

Research Background, Objectives, and Methodology

Background

Several of the CVRD's plans are supportive of rainwater management in the electoral areas. These include the 2010 *Regional Growth Strategy* (RGS), 2010 *Regional Sustainability Strategy* (RSS), and the 2014 *Rural Comox Valley Official Community Plan* (OCP).[2,3,4] This research builds from the greater collection of work being undertaken to support the goals of these plans to improve rainwater management in the Comox Valley. In particular, it refers to the recommendations in *A Rainwater Management Strategy for the Comox Valley Regional District Electoral Areas* from late 2013, by Fernhill Consulting and West Coast Environmental Law.[1] This strategy put forth recommendations for the CVRD on actions to take in the short, medium, and long terms, which included suggestions for the CVRD's OCP update in 2014. The strategy was developed in part from findings in the early 2013 report *Rainwater Management in the Comox Valley Regional District Electoral Areas: Current Practices and Future Options* by Fernhill Consulting.[5] Furthermore, it also builds upon the *Comox Valley Guide to Water Wise Development*, produced by the partnership Convening for Action on Vancouver Island (CAVI) in 2015.[6] The research team for this project includes representation from the CVRD's Engineering Services and Planning Services departments and the University of British Columbia's School of Community and Regional Planning and Land and Water Systems Program.

Objectives

The scope of this research is on rainwater management plan implementation tools and the role that they provide in integrating development with watershed management in the CVRD electoral areas. It is recognized that rainwater management plan implementation tools within the electoral areas are only a part of achieving watershed health objectives and there are several initiatives under way and in development in the Comox Valley beyond the scope of this research.

The objectives of this report are:

- to analyze the CVRD's current use of plan implementation tools for rainwater management;
- to identify how plan implementation tools can be used to manage rainwater, beyond the CVRD's current practices;
- to learn how other local governments, with similar jurisdictional contexts to the CVRD, are using these tools to manage rainwater;
- to conduct a criteria analysis of the plan implementation tools to assess how well each could potentially support the CVRD in meeting its rainwater management objectives;
- and to put forth recommendations for the CVRD's next steps.

Methodology

The methods included a literature review, data analysis, and focus groups. The literature review involved research into the context of the Comox Valley watersheds and the research already conducted on how to improve rainwater management in the electoral areas; theory and best practice on integrated watershed management; plan implementation tools for rainwater management, including development controls, bylaws, and enforcement techniques; and how other local governments in British Columbia (B.C.) are using these tools to manage rainwater. Data analysis included spatial analysis of plan implementation tool coverage within the electoral areas, as well as a criteria analysis of the plan implementation tools available to the CVRD to improve rainwater management. Two focus groups were held with CVRD staff in the Planning Services and Engineering Services Departments and an engineering consultant with hydrology expertise. The purpose of the first focus group was to collect information on the rainwater management challenges in the Comox Valley's watersheds and how the current plan implementation tools are addressing them and how they are not. The purpose of the second focus group was to collect views on the results of the plan implementation tool criteria analysis and recommendations for the CVRD's next steps.

Report Overview

The components of this report are grouped into five major sections:

Section 1 reviews the context for this research. It includes a description of the current Comox Valley rural landscape and a summary of why a change in rainwater management needs to occur.

Section 2 is about integrating development with watershed management. The broad goal of rainwater management is explained, followed by the CVRD's specific rainwater management objectives. The different development scenarios are then described, common rainwater source controls are discussed, and additional benefits of source controls beyond rainwater management are presented.

Section 3 covers rainwater management plan implementation tools in B.C. The plan implementation tools within a regional district's authority are described, including how they are used in combination with enforcement tools and technical tools.

Section 4 examines how plan implementation tools are being used for rainwater management. It outlines how the CVRD is currently using rainwater management plan implementation tools and the gaps that need to be addressed. Thereafter, it looks at how other local governments are using these tools beyond the present scope of the CVRD.

Section 5 includes a criteria analysis to determine which plan implementation tool(s) will best help the CVRD to meet its rainwater management objectives and puts forth recommended next steps for the CVRD.

Legislation excerpts and examples of rainwater management plan implementation tool language and maps are located in the appendix.

SECTION 1: CONTEXT

1. Context

The Comox Valley's watersheds are facing great challenges that need to be addressed. This section first describes the watershed planning context of the Comox Valley, covering biophysical features and land use. Thereafter, it summarizes the need for rainwater management in the electoral areas.

1.1 The Rural Comox Valley Landscape

The Comox Valley contains several watersheds. The high order watersheds of the Tsolum River and the Puntledge River converge into the Courtenay River before entering the Courtenay estuary. A number of the mid-order watersheds drain directly into the Georgia Strait (see Figure 1). The region's climate is that of mild, wet winters, and warm, dry summers. Climate normals from 1980-2010 show that November experiences the greatest amount of

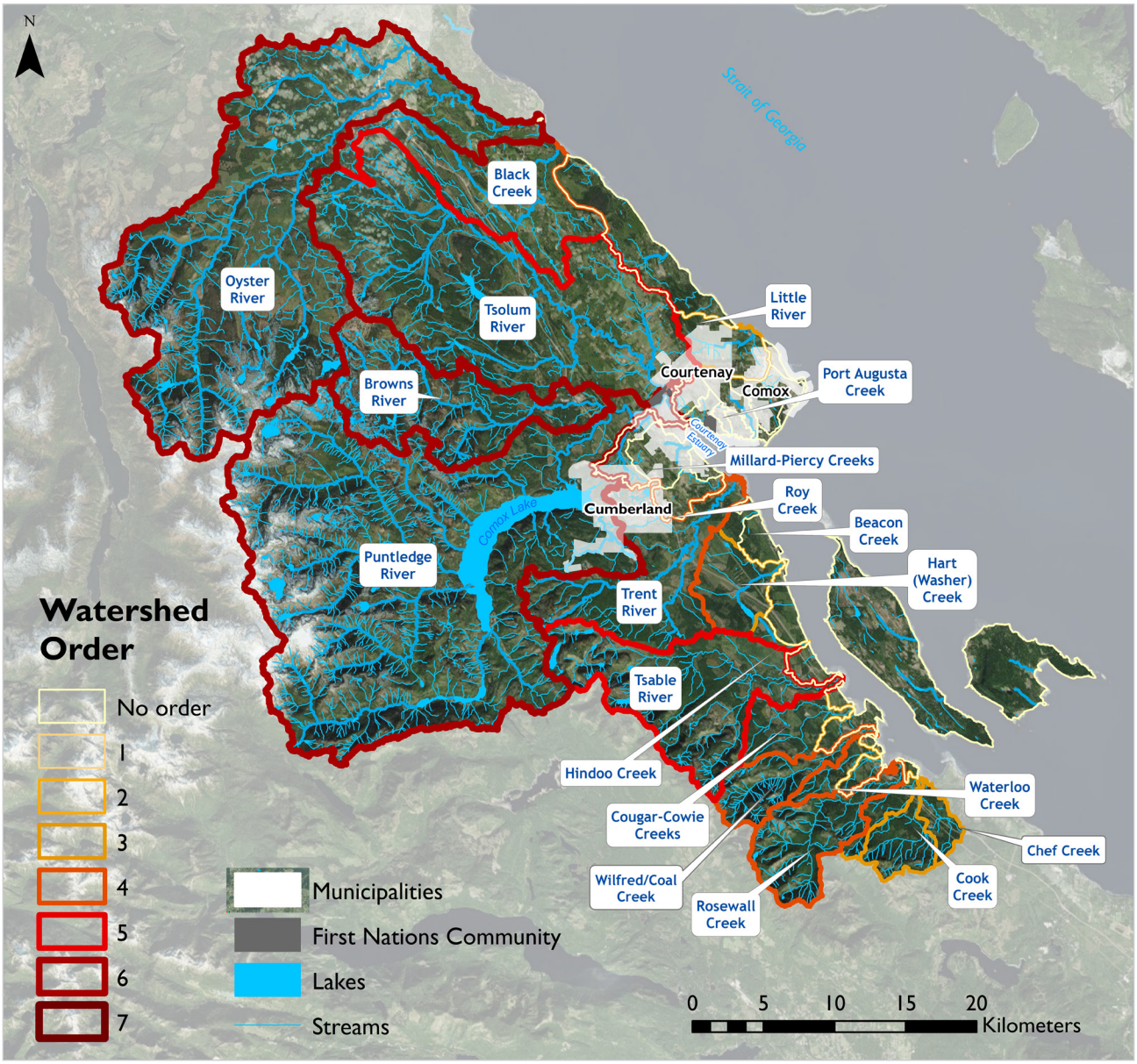

Figure 1. Watersheds of the CVRD.[12]

precipitation, approximately 192mm; whereas July only experiences approximately 27mm.[7] Climate change projections for Vancouver Island, however, indicate that by the 2050s this variation will become even more extreme. Precipitation is projected to increase by 6% in the winter and decrease in the summer by 14%.[8] The primary biogeoclimatic zone is Coastal Western Hemlock, Very Dry Maritime.[9] The valley contains a variety of ecosystems, such as forests, meadows, wetlands, and riparian areas, which are home to a diversity of plant and wildlife species.[10] Influenced by the climate and forest ecosystems, surface soils are predominantly of the Podzolic and Brunisolic soil orders.[11]

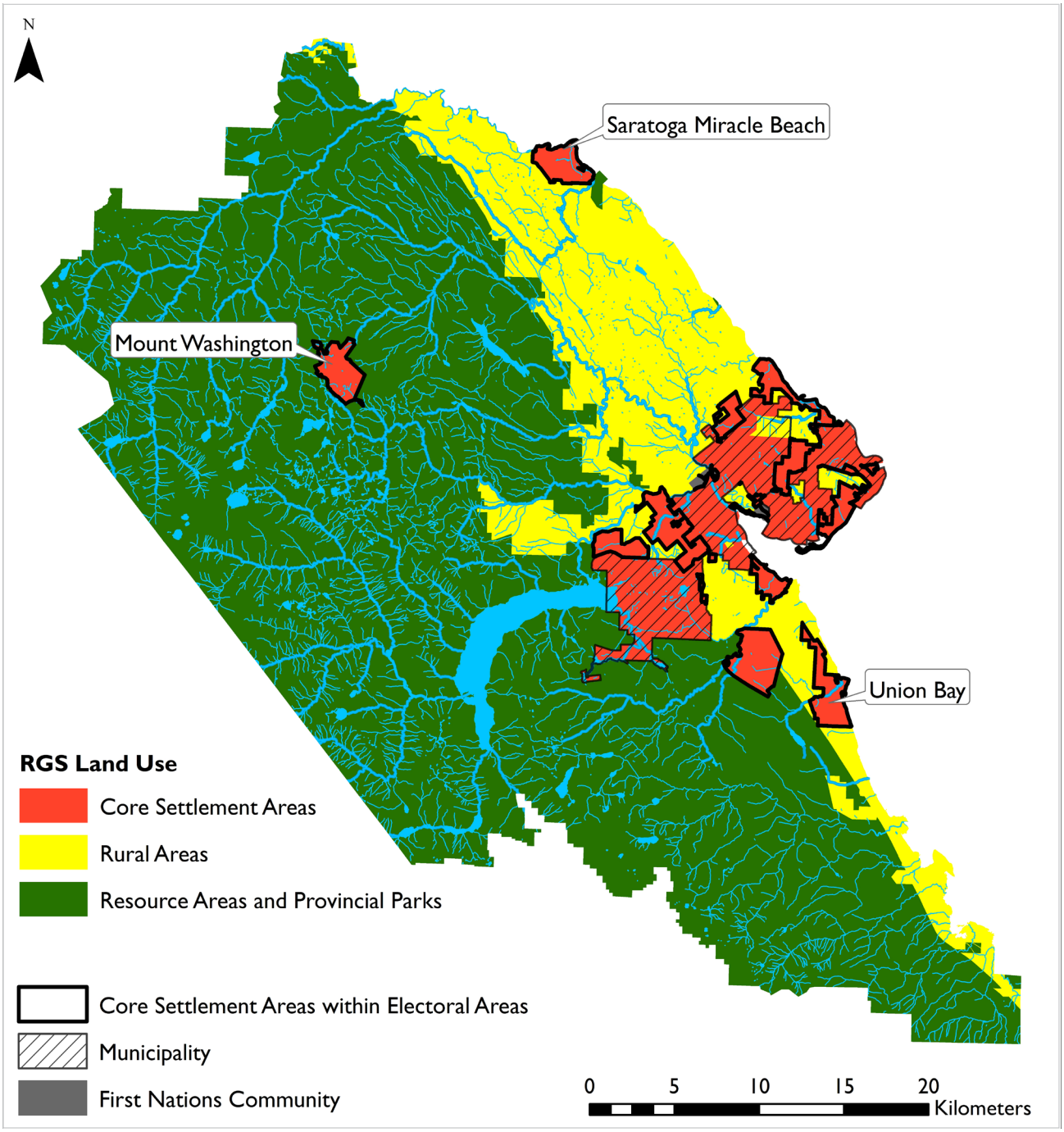

Figure 2. CVRD communities and Regional Growth Strategy (RGS) land use.[14]

Land use in the CVRD includes resource areas in the west, and agriculture, residential, commercial, and industrial areas in the east (see Figure 2). The Mount Washington resort area is the only non-resource based land use in the mountainous west. Settlement is concentrated in the three municipalities within the regional district - Courtenay, Comox, and Cumberland; and in settlement areas in the electoral areas.

The 2015 population of the whole Comox Valley was estimated at approximately 64,630; of which 21,900 resided in the electoral areas. Between 2008 and 2015, the population increased by approximately 1,730 people.[13] The Comox Valley population will continue to grow and could increase by as much as 50% over the next 20 years, requiring approximately 10,000 more housing units.[2]

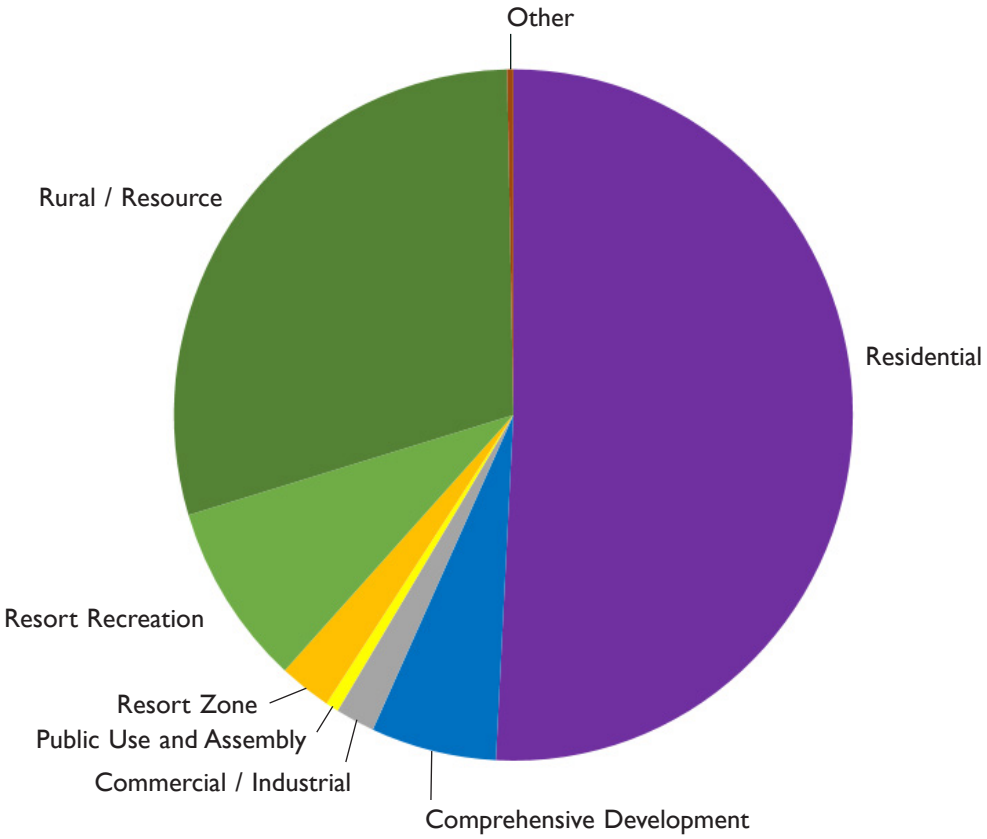

Figure 3. Current zoning within the electoral area core settlement areas, where 90% of growth will occur.[15,16]

A key objective of the RGS is to concentrate 90% of the valley's settlement within the settlement areas shown in Figure 2.[2] As of 2006, 65% of the population was located in the settlement areas and the remaining 35% was in the rural areas.[4] Figure 3 shows the current zoning in the core settlement areas in the electoral areas, highlighting that the majority of land use in these areas is residential. Although most of the increased housing demand in the CVRD will be met in the municipalities, some of it will be met in the settlement nodes of the electoral areas. In particular, master development agreements in place show that Saratoga Miracle Beach will see up to 143 new residential lots and that Union Bay could see up to 3,000 new mixed residential and commercial lots (see Figures 4 and 5).

Figure 4. Saratoga Miracle Beach core settlement area (see Figure 2 for the locational context within the CVRD).[17]

Figure 5. Union Bay core settlement area (see Figure 2 for the locational context within the CVRD).[17]

1.2 Why Do We Need to Manage Rainwater in the Comox Valley Electoral Areas?

As areas of the Comox Valley have been developed, it has resulted in landscape changes that are subsequently impacting the regional watersheds' hydrologic processes. Prior to development, rainfall was either intercepted by plants, evaporated, or slowly infiltrated into the earth. Of the infiltrated water, approximately 25% was deeply infiltrated to an aquifer and another 25% was infiltrated into the shallow surface soils to become interflow.[19] Flowing laterally, the latter was released to streams over time and eventually reached the ocean. However, due to the increase in impervious surfaces, such as pavement and structures, and the decrease in topsoil and vegetation, less rainfall is infiltrated on-site and runoff is increased (see Figure 6). With the aim of flood prevention, this runoff is removed from impervious areas into conveyance systems where it is delivered to streams and the ocean. In the municipal areas, the conveyance system primarily consists of an underground sewer system. In the electoral areas that are the focus of this research, it is made up of ditches (see Figure 7).

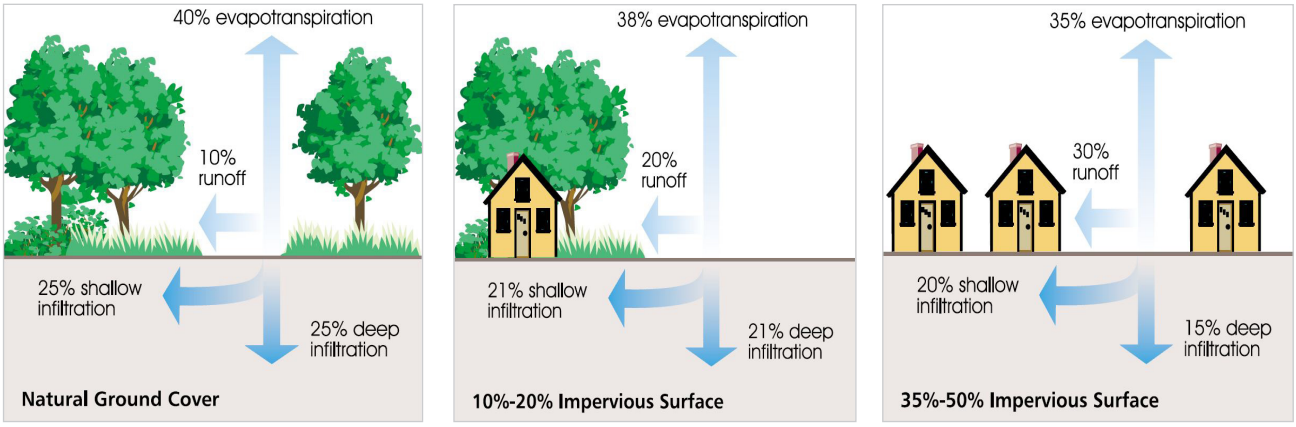

Figure 6. Alterations to hydrologic processes from typical residential development. Figure credit: Prince George's County Department of Environmental Resources.[19]

With these alterations to the watersheds' hydrologic processes, there are impacts to the built environment and ecosystems. Rainwater runoff is drastically increased during high rainfall events, which has resulted in exceedance of the ditch systems' capacity. This problem is exacerbated by the ditches' interception of interflow paths, even in very rural areas where the amount of impervious surfaces may not be significant. It also increases stream erosion, which widens streams and reduces the flow depth, further contributing to flooding.[20] These alterations result in the flooding of roads and properties that are located downstream in the watersheds (see Figures 8 and 9). The flooding of properties and agricultural lands has even led to lawsuits in some cases, such as in the Lazo Watershed and the Little River Watershed. Defendants in these cases have included subdivision developers, the Province, and the CVRD.[21,22] In addition to the problem of there being too much water during rainfall events, these changes to hydrologic processes also contribute to reduced stream baseflows

during the summer months, because less rainfall is able to infiltrate into the shallow surface soils. There have also been increased erosion and water quality issues.[1]

These water quantity and quality impacts are also causing harm to several of the valley's ecosystems and species. Sensitive aquatic ecosystems such as riparian areas and wetlands, and the species that live there, directly depend on the proper functioning of the watershed and are stressed by changes in water quantity and quality.[23] Fifty-five of the Comox Valley's species are currently at risk and salmon runs have been unstable.[10] Moreover, these impacts will be further exacerbated by climate change.[24] The increase in winter precipitation will put greater stress on ditches and likely exceed their capacity with greater frequency and intensity; and the decrease in summer precipitation will result in even lower summer baseflows, which can also increase water quality issues due to high concentrations of contaminants, such as suspended sediment from erosion, because the water is less diluted. These impacts are a result of cumulative effects within watersheds, by which incremental development on several single properties can lead to serious impacts.

Figure 7. Roadside ditch part of the electoral area's rainwater conveyance system. Photo credit: Jenna Cook

Figure 8. Flooding south of Union Bay in 2014. Photo credit: Comox Valley Echo.[25]

Figure 9. Overflowing ditch in Tsolum Watershed in 2009. Photo credit: Marcel Tetrault.[26]

Figure 10. Low summer baseflows in Rosewall Creek in 2015. Photo credit: Stephen Hume.[27]

SECTION 2:
INTEGRATING DEVELOPMENT WITH WATERSHED MANAGEMENT

2. Integrating Development with Rainwater Management

To address this problem of cumulative effects and prevent further impact to the hydrologic processes of the watersheds in the CVRD, development and rainwater management can be integrated. This section explains the broad goal of rainwater management and summarizes the CVRD's specific objectives. It then outlines the different development scenarios that occur in the CVRD and introduces rainwater management source controls.

2.1 What Is the Goal?

The goal of integrated rainwater management is to design development in a way that mimics the pre-development hydrologic processes of the watershed. The term 'rainwater management' is starting to replace the term 'stormwater management', as it more accurately reflects the view that rain is a resource that should be managed where it falls, as opposed to a problem that needs to be dealt with like stormwater runoff. Mimicking natural processes can be achieved by "slowing, spreading, and sinking" rainwater.[28] That is, slowing the runoff down, spreading the runoff over landscaping, and sinking it into the ground.[28] To translate these objectives into actions that can be achieved on the ground, targets are developed for rainwater retention and infiltration. By mimicking natural hydrologic processes, the impacts from land development on ecosystems and properties discussed above can be mitigated.

The greatest benefits will be achieved when mitigation occurs at the property, neighbourhood, and the watershed scales simultaneously (see Figure 11). The objective of mitigation through the use of source controls at the property scale is to retain rainwater on-site, and slowly infiltrate it into the ground. At the neighbourhood scale, the objective is to retain and store rainwater at a larger scale and to slowly release it into the ground. At the watershed scale, the aim is to protect stream health through buffer zones and to improve flood storage.[24] This research is focused on mitigation at the property and neighbourhood scales.

Figure 11. Property, neighbourhood, and watershed scales. Figure credit: Partnership for Water Sustainability in B.C.[29]

Rainwater management science is becoming more widespread and is rapidly advancing. Since the Province published *Stormwater Planning: A Guidebook for British Columbia* in 2002, several further provincial and regional guides have built upon and improved the science.[30,11] These guidelines include those produced by the Partnership for Water Sustainability in B.C. in the *Beyond the Guidebook* initiative that specifically builds upon the original guidebook by the Province.[31] A key progression has been the quantification of the factors specific to each watershed, determining the ability to support land development and the extent of rainwater source controls required to mimic pre-development hydrology.[11] In some cases, the quantification of factors is still coarse. This is primarily due to the need for more accurate data, such as digital elevation, slope, soils, climate, and stream flow information. Further data will allow for greater customization of rainwater management targets for the different hydrologic zones within watersheds.[32]

2.1.1 CVRD Rainwater Management Objectives

The CVRD has set objectives for rainwater management in the RGS, RSS, and rural OCP. The objectives are consistent with the broad goal of rainwater management. By establishing sound objectives, the CVRD made an important first step towards improving rainwater management in the electoral areas. The objectives are listed below.

Regional Growth Strategy

5C. Stormwater is managed to preserve ecosystem and watershed health.

Regional Sustainability Strategy

3.7 goal. Stormwater (rainwater) is managed to maintain the performance of watershed systems, preserve ecosystem health and protect groundwater.

Official Community Plan - Natural Environment Objectives

1. *To identify and protect unique natural features and characteristics of the Comox Valley.*
2. *To protect and restore natural systems, physiographic areas, threatened sensitive ecosystems and environmentally sensitive areas.*
3. *To protect the quality of air, land, and water, and through stewardship, maintain the quantity of ground water and surface water.*
4. *To protect, restore and enhance coastal shorelines, streams, wetlands and the marine environment.*
5. *To consider impacts of a development application on the hydrology at a watershed scale.*
6. *To ensure all developments within drinking water supply watersheds and recharge areas are reviewed within the context of the precautionary principle.*
7. *To implement rainwater management practices and policies that preserve and restore the natural water balance during development and re-development in order to maintain and improve watershed health and protect downstream properties and infrastructure.*
8. *To maintain or restore the natural hydrological regime in CVRD watersheds, including natural rates of surface runoff, infiltration to shallow groundwater (interflow) and infiltration to deep groundwater with an aim, where possible, to restore the regime to its proper functioning condition.*
9. *To ensure the on-site hydrology, including surface runoff, interflow and groundwater, is maintained.*
10. *To control future development in a way that maintains and/or enhances significant groundwater recharge and prevents undesirable groundwater level decline and reduction in base flow to watercourses.*
11. *To implement practices that support resilient natural systems that can better adapt to pressures resulting from climate change.*
12. *To manage development and construction activity to prevent sediment loading to receiving watercourses, K'ómoks Estuary, the marine environment and the sea.*
13. *To foster shared responsibility among all levels of government and the community, for protecting and restoring watershed, estuary and coastline health.*

2.2 Development Scenarios

The different development scenarios that take place in the CVRD include new development, re-development, and subdivisions. New development refers to development that takes place on properties that were not previously developed, often referred to as 'greenfield' development. Re-development refers to the scenario where a property already contains development, but is either added to or replaced with new development. Re-development most often results in a larger impervious surface footprint on the property. Subdivisions refer to the scenario in which a single property is divided into two or more new properties. When the new properties are developed, the impervious surface footprint of the area is increased. These development scenarios can take place within different types of zoned areas, for different land uses; however, as the zoning shows, most of the development in the electoral areas is for residential uses. The type of development scenario and the scale of development determines which type of rainwater management source control should be used. New development, re-development, and small subdivisions are considered to be property-scale; whereas larger subdivisions with several properties are considered to be neighbourhood scale.

2.3 Rainwater Source Controls

To reach the objective of designing development in a way that mimics pre-development hydrologic processes at the watershed scale, rainwater source controls must be used at the property and neighbourhood scales. There are several different types of source controls that can be used to slow, spread, and sink rainwater.[28] In addition to controlling the flows of water, these source controls often filter out contaminants, helping to improve water quality in ditches and streams. Commonly used source controls at the property and neighbourhood scales include absorbent landscaping and retention facilities.[28,33,34,35]

2.3.1 Absorbent Landscaping

Absorbent landscaping consists of topsoil and the vegetation that grows in it (see Figure 12). It acts like a sponge to capture rainfall where it lands and slowly sink it into the ground, preventing direct runoff. The greater the area of absorbent landscaping, the more the rainwater can be spread throughout a property.[28] In order for the topsoil to perform this task well, it needs to be of sufficient depth and composition. Optimum topsoil depths are considered to be 450mm and the higher the organic matter content, the better.[36] However, organic matter content for lawns should not exceed 8% by dry weight so as to avoid poor surface stability and load capacity.[20] This enhances the absorptive capacity of the soil, allowing it to hold greater volumes of water and retain it for longer durations of time.[37,38] Pervious pavement can allow for absorbent landscaping to still provide this service while providing the function of pavement; however, measures must be taken to avoid soil compaction (see Figure 13).[34]

Figure 12. Absorbent landscaping on a single-family lot front yard. Photo credit: Lori Stalteri.[39]

Figure 13. Pervious pavement. Photo credit: Rain Community Solutions.[40]

2.3.2 Retention Facilities

Rain gardens and detention ponds also provide the services of slowing, sinking, and cleansing rainwater runoff. They can be designed so that runoff from roofs and paved areas is directed to them. They can also contain underground drains and water storage areas, so that rainwater can be slowly infiltrated into the ground during high rainfall events.[33] Rain gardens and detention ponds are similar; the key differences being that rain gardens are often smaller and are used on single lots and detention ponds are larger and used at the neighbourhood scale. They can both be designed to capture and infiltrate certain volumes of water, depending on a variety of factors at the property, neighbourhood, and watershed scales; such as climate conditions, soil type, and impervious surface coverage. Bioswales also have the potential to retain water; however, their main purpose is to convey excess rainwater, such as from a road to a retention facility. Their absorbent capacity if often easily exceeded when surface runoff occurs. Figure 14 shows a rain garden on a residential property, Figure 15 shows a detention pond for a subdivision, and Figure 16 shows a bioswale adjacent to a road.

Figure 14. Rain garden on a single-family lot. Photo credit: Rain Dog Designs.[41]

Figure 15. Neighbourhood scale detention pond. Photo credit: Stormwater Partners of Southwest Washington.[42]

Figure 16. Neighbourhood scale bioswale adjacent to a road. Photo credit: City of Seattle.[35]

2.4 Additional Benefits

In addition to the benefits of rainwater management for ecosystems, properties, and public infrastructure, there are other benefits from these practices as well. Notable benefits are, but not limited to:

- Outdoor water conservation during the dry summer months, due to the ability of absorbent topsoil to hold and retain water and reduce irrigation needs.[43]
- Absorbent landscapes with deep and healthy topsoils support healthier plants and do not require the application of artificial fertilizers which can cause harm to aquatic ecosystems.[23]
- Healthy landscaping vegetation is also more resilient to pests, which can be a problem at neighbourhood and regional scales.[37]
- There are an incredible amount of benefits from maintaining and/or increasing the abundance of plants, such as enhancing the ecosystem services of wildlife habitat provision, carbon sequestration, and clean air.[44]
- A broad benefit is that of increasing natural capital, the connection between nature's services and economics. Communities in B.C. are starting to assess their natural capital and make plans to conserve and create more of it, knowing that not only is more green infrastructure better for people and ecosystems, but it is also better for the financial bottom line.[45,46,47]

SECTION 3:
RAINWATER MANAGEMENT PLAN IMPLEMENTATION TOOLS IN B.C.

3. Rainwater Management Plan Implementation Tools in B.C.

To obtain rainwater management objectives, there must be a mechanism by which mitigation is required. There are a number of plan implementation tools that can be used to achieve this. In this section, the regional district jurisdiction over rainwater is explained and plan implementation tools for rainwater management within this jurisdiction are described.

3.1 Regional District Jurisdiction Over Rainwater

Regional districts in B.C. have the authority to influence rainwater management with delegated power from the Province through the *Local Government Act* and the *Community Charter*.[48,49] Unless a power has been delegated, the authority remains with the Province. Municipalities have some further rainwater management powers that do not apply to regional districts, such as for roads, subdivision approval, controlling substances entering streams, and tree protection outside of areas considered to be hazardous.[50,51] The Ministry of Transportation and Infrastructure (MOTI) has the power over subdivision approval in electoral areas and is primarily responsible for the ditch drainage system.[1,52] However, there are several implementation tools available to regional districts to manage rainwater, such as bylaws and Development Permit Areas (DPAs). When a local government has the authority to regulate a particular aspect of land use, they have several options and are not limited to any particular choice.[51]

3.2 What Are the Rainwater Management Plan Implementation Tools?

Plan implementation tools are the means by which rainwater management objectives, for properties, neighbourhoods and watersheds, can be achieved. The tools translate high level objectives and policies into implementable actions that are to be taken on the ground. They include tools that influence the outcome of development and those that support maintenance of rainwater infrastructure to ensure that objectives continue to be met over the long term. Technical tools are often used to support plan implementation tools, such as with rainwater management targets. They are briefly described, particularly how they support plan implementation tools.

3.2.1 Development, Regulatory, and Enforcement Tools

Rainwater management plan implementation tools can be grouped into the three categories of development, regulatory, and enforcement tools. Development tools influence the outcome of land alteration at the time of development. Regulatory tools can be used for this as well and can additionally be enforced over the long term. Enforcement tools can be used to support the objectives of the development and regulatory tools over the long term. The powers in these tools can be used individually or in combination with each other. For example, if a local government chooses to develop a comprehensive rainwater management bylaw, it could create a bylaw that makes use of its powers to regulate runoff and landscaping.[48] Similarly, if it chose to develop a comprehensive DPA, it could make use of its ability to protect the natural environment, protect development from hazardous conditions, and to promote water conservation. These tools are described in Table 1 below. The strengths and weaknesses of the tools and applicability to the CVRD electoral areas are discussed in Section 5. Excerpts of legislation are located in Appendix A.

Plan Implementation Tool Type	Plan Implementation Tool	Description	Regional District Legislation
Development - Development Permit (DP)	Development permit areas (DPAs)	A regional district may designate DPAs for several purposes, some of which are related to rainwater management. These include protection of the natural environment, protection of development from hazardous conditions, and to promote water conservation. If a site is located within a DPA, then a DP is required for works beyond a certain threshold. DPs are a tool to control the outcome of activities at the time of development.[1,5,48,51,53,54]	*Local Government Act* ss.488-491
Development - Building Permit (BP)	Building regulation bylaws	A regional district can require a property owner to meet rainwater management requirements set out in a bylaw, as a condition of issuing a building permit.[1, 5, 51] The new *Building Act*, coming into legal force December 2017, should not affect a regional district's ability to exercise their building regulation authority regarding administrative requirements.[55,56]	*Local Government Act* s.298
Regulatory - Bylaw	Zoning	A regional district can establish maximum limits on the impervious surface coverage of parcels, specific to different land use zones.[5,48,51,53,54]	*Local Government Act* s.479
Regulatory - Bylaw	Runoff control requirements	A regional district can set requirements for the ongoing disposal of surface runoff and storm water, establish maximum limits on impervious surface coverages, and create zones for the requirements.[5,48] Since the ability to require 'ongoing disposal' of rainwater is stated in the *Local Government Act*, a regional district can set requirements for ongoing maintenance of on-site rainwater source controls.[5,48,51,53,54] An establishing bylaw for this service is required.[54]	*Local Government Act* s.338 *Local Government Act* s.523
Regulatory - Bylaw	Special drainage and sewerage authority	A regional district can regulate the design and installation of drainage provided by persons other than the regional district.[5,48,51,54]	*Local Government Act* s.306
Regulatory - Bylaw	Requirements respecting drainage works	A regional district can establish requirements for persons undertaking construction to maintain proper flow of water in a stream or ditch.[5,48,51]	*Local Government Act* s.312
Regulatory - Bylaw	Screening and landscaping	A regional district can set landscaping standards for the purpose of protecting and restoring the natural environment and preventing hazardous conditions.[1,5,48,51,53]	*Local Government Act* s.527
Regulatory - Bylaw	Subdivision servicing requirements	With approval from the Province, a regional district may adopt a subdivision development servicing bylaw. Through this bylaw, a regional district can create rainwater management requirements for subdivisions.[1,5,48,51,53]	*Local Government Act* s.506
Regulatory - Bylaw	Development approval information (DAI)	A regional district can require information from a development applicant to assist with making an informed decision, including site and watershed hydrology information. The information can be used to develop conditions, such as on-site rainwater mitigation, required for the development to proceed. Development types that can trigger the requirement are rezoning, DPAs, and temporary use permits.[1,5,48,51,53]	*Local Government Act* ss.484-487
Regulatory - Bylaw Fines	Fines to support maintenance of rainwater infrastructure over the long term	A regional district may set out fines in a bylaw to support bylaw compliance.[48,49,54] It is critical that rainwater infrastructure on private lots performs as it should over time, and establishing fines for non-compliance is a means to support this.[1,51]	*Local Government Act* s.413 *Community Charter* s. 261
Enforcement - Security	Security deposit to support enforcement at the time of development, under bylaws and DPAs	A regional district may collect a security deposit from a development applicant, which is returned after the successful installation of rainwater management source controls as planned. If a developer or property owner does not install the infrastructure as planned, then the regional district can use the security deposit to do so.[1,5,48,51]	*Local Government Act* s.502 *Local Government Act s.509*
Enforcement - Covenant	Covenant to support maintenance of rainwater infrastructure over the long term	A regional district may require a covenant to be registered on title at the time of development. It is limited to development scenarios in which a regional district can exercise discretion, particularly rezonings, phased development agreements, and subdivision approvals if they have subdivision approval powers. DPs do not meet the requirement of being discretionary. A covenant can include a maintenance plan for rainwater management infrastructure on private lots. Covenants are registered on title, and therefore stay with the land through different owners. Covenants can include rent charges, similar to fines if the covenant is breached. In order to be effective, and stand in court, covenants need to be monitored by the regional district.[1,5,51,53,54,57]	*Land Title Act,* s.219

Table 1. Regional district rainwater management plan implementation tools.

3.2.2 Technical Tools

Tools of a technical nature are frequently used in combination with plan implementation tools. The technical tools are often what determine the rainwater management requirements. These requirements can be common standards or watershed-specific; and they can be either prescriptive, performance-based, or a combination of both. An example of a combined approach is to require that a minimum prescriptive topsoil depth and performance-based runoff capture and infiltration targets are met. Rainwater management science and technical tools are quickly advancing and it is important to allow for incorporation of these advancements within the plan implementation tools discussed above.

The following are commonly used rainwater management technical tools:

- Common standards are found in provincial and regional design guidelines, such as in *Stormwater Planning: A Guidebook for British Columbia*, *Beyond the Guidebook* resources, the *Master Municipal Construction Documents,* the Metro Vancouver *Stormwater and Source Control Design Guidelines,* and Ministry of Transportation and Infrastructure (MOTI) design guide.[30,58,59,34,60]
- Watershed-scale plans contain rainwater management requirements that are specific to a watershed, such as in Integrated Stormwater/Rainwater Management Plans (ISMPs/IRMPs).
- Neighbourhood-scale plans will often base rainwater management targets on the watershed that the neighbourhood is located in or will sometimes use common best practice standards.
- Property-scale rainwater management plans will usually outline mitigation measures to mimic pre-development hydrologic processes. 'Pre-development' can refer to prior to any development on the property or to the situation prior to a particular development application.
- Models, such as the Water Balance Model (WBM) are used to determine rainwater management targets for properties and neighbourhoods, based on the physical characteristics and current impervious surface coverage of the watershed it is located within. Through modelling, targets for retention volume, infiltration area, and base flow release rate are customized to both the property and the watershed. A version of this model, the Water Balance Model Express (WBME), has been developed for home-use by property owners planning to develop and re-develop their properties, saving them the cost of hiring professionals.[33]

SECTION 4:
HOW PLAN IMPLEMENTATION TOOLS ARE BEING USED FOR RAINWATER MANAGEMENT

4. How Plan Implementation Tools Are Being Used for Rainwater Management

4.1 How Is the CVRD Currently Using These Tools?

The CVRD presently has some of the plan implementation tools for rainwater management discussed above in place. Since the review of current practices and recommendations by Fernhill Consulting were put forth in 2013, some advancements have been made; however, there are still significant gaps between OCP policies and plan implementation tools. This section first reviews the CVRD's rainwater management policies and looks at the implementation tools currently in place to support them. This is followed by a description of the technical tools presently utilized to support these plan implementation tools. The gaps in the CVRD's current use of rainwater management plan implementation tools are discussed thereafter.

4.1.1 CVRD Rainwater Management Policies

The policies in the OCP are supportive of the CVRD's rainwater management objectives outlined in Section 2. The purpose of the policies is to support the objectives and the purpose of the plan implementation tools is to support the policies. The OCP includes policies for protection of the natural environment and biodiversity, protection of ground water, flood mitigation, water conservation, climate change, and natural hazards.[4] The policies most relevant to plan implementation tools for rainwater management are listed below.

Natural Environment - Natural Systems and Biodiversity Corridors Policies

3. *Protect aquatic ecosystems, including riparian areas with tools such as the provincial riparian areas regulation, development permit area designations and guidelines and sound rain water management policies and practices.*

6. *Use design with nature principles for new development to reduce environmental, social and economic vulnerabilities and to build community and ecological resiliency.*

Natural Environment – Watershed Management/Protection Policies

1. *Require an applicant to hire a qualified professional, where appropriate, to assess potential water quality and quantity impacts, and submit an on-site drainage report with recommendations to ensure the pre-development or natural hydrologic regime is maintained or restored by the development, prior to development approval.*

2. *Use rain water management techniques in the design and construction of new development to control quantity and quality of rain water runoff. The degree of control and techniques used will depend on the scale of development and the conditions in the downstream receiving water bodies in order to avoid adverse effects on the downstream aquatic environment and adjacent lands.*

3. *Ensure the inclusion of rainwater management techniques in the design and construction of all new developments including retention of native vegetation, vegetates swales and pervious surfaces.*

4. *Require hydrological studies and watershed management plans to guide multi-lot development, including physiographic mapping, hydrological studies, integrated rainwater management plans, detailed mapping of sensitive ecosystems and consideration of linked ecosystem networks.*

4.1.2 Current CVRD Rainwater Management Plan Implementation Tools

Plan Implementation Tool	Tool Coverage	Land Use Applicability	Development Scenario Trigger	Rainwater Management Objective	Rainwater Management Requirements
Aquatic and Riparian Habitat DPA	30m buffer surrounding all riparian areas, including streams, lakes, wetlands, and shorelines (see Figure 17).	All land use.	Any development scenario.	To protect riparian areas.	A performance-based approach is used: • An assessment by a professional biologist with assistance of a professional with expertise in assessing bio-physical hazards. • No buildings, structures or retaining walls should be constructed within 30m of the present natural boundary of the sea, stream or watercourse unless mitigative measures are proposed that will result in the same or greater protection of a 30m buffer. • Total Impervious Area (TIA) within the DPA should not exceed 10% (unless mitigated).[4]
Commercial and Industrial Development DPA	Areas zoned for commercial and industrial uses (see Figure 17).	Commercial and industrial.	Any development scenario, unless 10sqm or less.	To protect water quality and hydrologic processes.	A performance-based approach is used: • A rainwater management plan by a professional engineer is required. • Protect water quality and maintain post-development peak flows to those of pre-development flow patterns and volumes over the entire water season (based on the existing condition of the site prior to the development application).[4]
Steep Slopes DPA	Areas with steep slopes, hazardous slopes, in close proximity to banks (see Figure 17).	All land use.	Any development scenario.	To protect water quality and hydrologic processes.	A performance-based approach is used: • A rainwater management plan by a professional engineer is required. • Protect water quality and maintain post-development peak flows to those of pre-development flow patterns and volumes over the entire water season (based on the existing condition of the site prior to the development application).[4]
Kensington Comprehensive DPA	Kensington comprehensive development area (see Figure 17).	Commercial, multi-family, non-residential and intensive residential.	Any development scenario, except accessory buildings.	To protect water quality and hydrologic processes.	A performance-based approach is used: • A rainwater management plan by a professional engineer is required. • Protect water quality and maintain post-development peak flows to those of pre-development flow patterns and volumes over the entire winter season (based on the existing condition of the site prior to the development application).[4]
Mount Washington Mixed Use DPA	Mount Washington resort area (see Figure 17).	Commercial, industrial, and multi-residential.	Any development scenario, unless 10sqm or less.	To protect water quality and hydrologic processes.	A combined performance-based and prescriptive approach is used: • A snow/rainwater management plan prepared by a professional engineer is required. • There shall be no net increase in peak rainwater runoff from the site to adjoining lands. • Requires BMPs for mitigating siltation, erosion, and pollution of water course.[61]
DAI Bylaw	Entirety of the electoral areas.	All land use.	Large scale development scenarios triggered by rezoning, DPAs, and temporary use permits.	To protect water quality and hydrologic processes.	A performance-based approach is used: • A report is required that provides options for the suitable collection, storage, and dispersal of rainwater.[63]
Zoning Bylaw	Entirety of the electoral areas.	All land use.	Any development scenario.	To limit parcel (building) and paved surface coverage.	A prescriptive approach is used: • For single-family residential zones, the maximum building coverage ranges from 15%-35%; no paved surface coverage applies. • For residential multiple zones, the maximum building coverage is 40% and 60% for buildings and paved areas. • For commercial and industrial zones, the maximum building coverage is 50%.[16]
Security	N/A	All land use.	DPAs.	To support enforcement of the rainwater management requirements at the time of development.	As per the requirements of the DPA.[62]
Subdivision approval recommendation to the MOTI Approving Officer (CVRD can enter into a section 219 restrictive covenant)	Entirety of the electoral areas.	All land use.	Subdivisions.	To protect the natural environment, fish bearing habitat, drainage systems, and properties from flooding.	At the discretion of the CVRD and the MOTI.[64]

Table 2. Current CVRD rainwater management plan implementation tools.

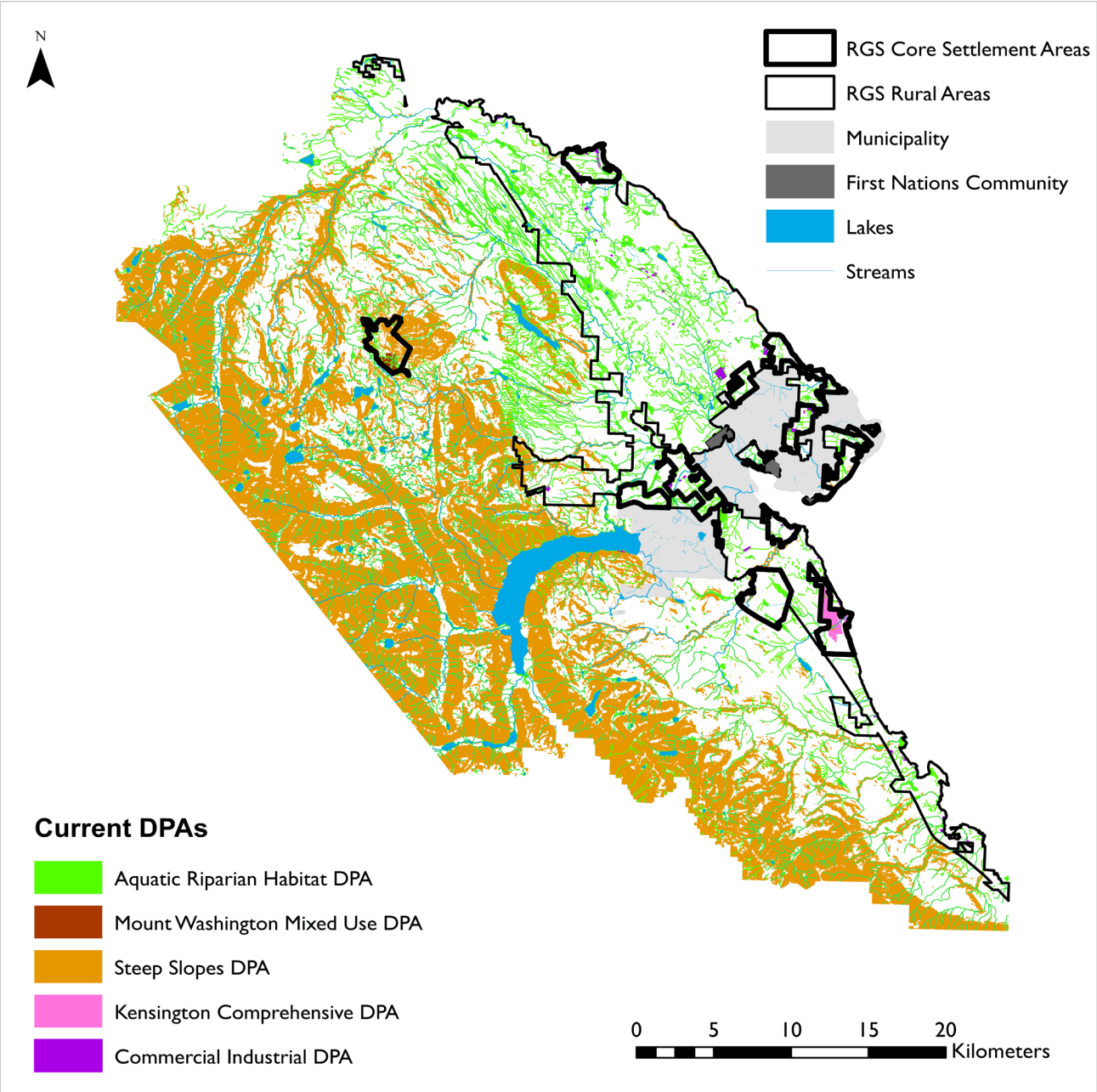

Figure 17. Current CVRD rainwater management DPA coverage.[65]

4.1.3 Current CVRD Rainwater Management Technical Tools

The CVRD also uses technical tools for rainwater management to support the plan implementation tools listed above. As mentioned, a property-scale rainwater management plan prepared by a professional is a commonly used tool by the CVRD. The rainwater management requirements are performance-based with a target of no net change from pre-development hydrologic processes. The plan needs to demonstrate how this target will be met through the use of rainwater source controls. Furthermore, the CVRD has recently developed WBM targets for the region's watersheds and the WBME tool, allowing property owners develop a rainwater plan and select source controls themselves.[11,66]

In addition to these tools currently within the CVRD's authority, it is important to note that the MOTI design guidelines apply to the Comox Valley rural areas' roads and ditches under the MOTI's authority. The guidelines outline the requirements for Subdivision Development Drainage Reports, which must thoroughly assess the impacts of a proposed development on streams and make recommendations to ensure impacts to downstream flooding and stream erosion are mitigated.[60] However, the extent to which these requirements are followed in practice is uncertain given the watershed challenges that the Comox Valley is currently facing.

4.1.4 Gaps in the CVRD's Rainwater Management Plan Implementation Tools

The CVRD currently has a number of tools to support their rainwater management objectives and policies in place. However, there are still significant gaps in these tools that need to be remedied.

DPAs

The DPAs have limited spatial and temporal applications. Figure 18 shows the gaps in DPA coverage in the RGS core settlement and rural areas. As the map demonstrates, the requirements do not apply to the majority of the land base. Protecting riparian areas with a buffer is a necessity, however, 30m only offers limited protection compared to wider buffers of up to 100m.[24] Further, maintaining natural hydrologic processes in the source zones of watersheds, the parts of the watershed outside of riparian areas, is vital for the protection of streams and mitigation of downstream flooding.[32] Moreover, the requirement in the DPAs that post-development flows mimic pre-development flows, refers to the hydrologic flows prior to the development application in question, not prior to any development at all. Therefore, returning the watershed to its natural hydrologic processes is less likely without pre-development referring to a natural setting.

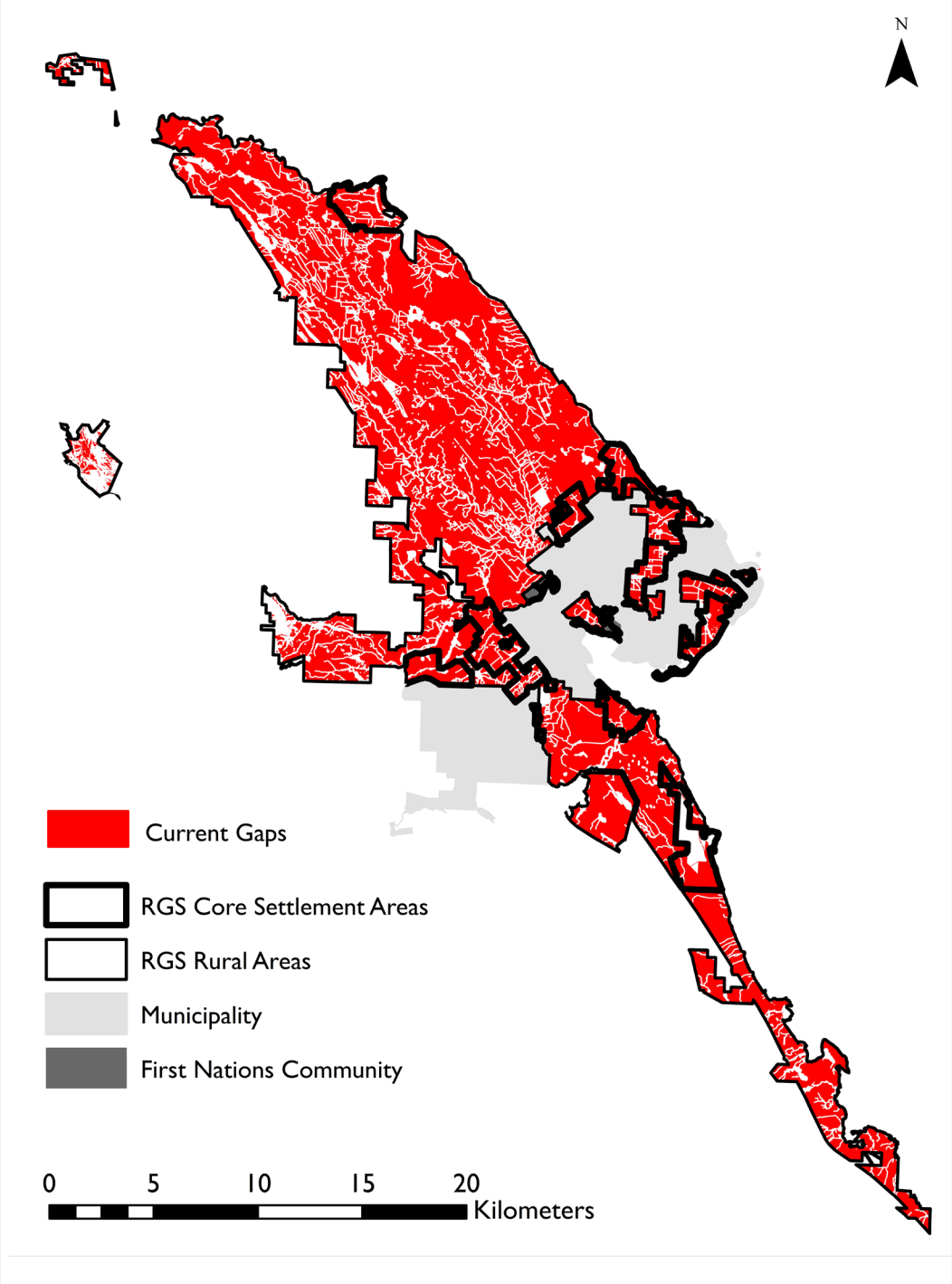

Figure 18. Current rainwater management DPA plan implementation tool gaps in the RGS core settlement and rural areas.[67]

Zoning Bylaw

The limitations for impervious surfaces under the zoning bylaw also contain gaps. Each zoning type contains a building footprint limit, however, only the multiple residential zoned area includes a limitation for paved areas as well. The limit for the building footprints for the other zoning types is better than not having a requirement at all. That said, it would be more effective if all zoning types had a limit for impervious surface coverage.

DAI Bylaw

The DAI bylaw is a useful tool, yet it currently only applies to large-scale developments and is only triggered by rezonings, DPAs, and temporary use permits. Thus, it is not addressing incremental development.

Subdivision Approval Recommendation

The CVRD can provide a recommendation to the MOTI Approving Officer, and request a restrictive covenant, if they believe that it will affect the natural environment, fish bearing habitat, drainage systems, or flooding risk. However, it is only a recommendation and the official authority lies with the MOTI Approving Officer.

Therefore, outside of DPAs and rezoning scenarios, the CVRD currently has no tools in place by which rainwater management source controls can be made required. This is particularly a concern in the core settlement areas, where 90% of the CVRDs' development will occur. Furthermore, watershed impacts are frequently the result of incremental development and are a problem of cumulative effects. Thus, it is important that hydrologic processes are protected throughout the entirety of watersheds and that incremental development is subject to rainwater management requirements.

4.2 How Are These Plan Implementation Tools Being Used By Other Local Governments in B.C.?

In order for the CVRD to make an informed choice about which rainwater management plan implementation tool(s) to utilize, it is important to learn how other local governments are using them. Rainwater management plan implementation tools from regional districts and municipalities were studied through literature review. The types of literature reviewed primarily included bylaws, OCPs, development guidelines, and stormwater management plans. Since the examples are based solely on plan implementation tool literature, how the tools are administrated and enforced in practice is not covered. There were no examples found of a regional district with a rainwater management bylaw or DPA coverage more expansive than the CVRD. In this section, first the rainwater management plan implementation tools of all three of the Comox Valley municipalities are summarized. This is followed by examples from local governments that are using tools that are within the authority of the CVRD, but are beyond the scope of the CVRD's current practices. Refer to Appendix B for excerpts of rainwater management requirement official language and maps for these examples.

4.2.1 CVRD Municipalities

City of Courtenay's DPAs and Subdivision Approval

The City of Courtenay has had rainwater management requirements in its DPAs and for subdivisions since 2005. The policies and requirements are easily accessible in Courtenay's OCP.[68] The objective of these requirements is to protect the natural environment and move towards a watershed-based approach to development. The DPAs apply to commercial, industrial, multi-residential, and intensive residential land uses. If development on a property located within a DPA is proposed, then unless exempt, it must meet the DPA guidelines. Courtenay also exercises its municipal control over subdivision approval to require rainwater management in all subdivisions throughout the entire city. A combined performance and prescriptive approach is used for the requirements and a drainage plan prepared by a professional Engineer must be provided. It needs to outline how post-development peak flows will match that of pre-development peak flows. 'Pre-development' in Courtenay's case refers to the condition of the site prior to the development application. In addition, all landscaped areas require a minimum topsoil depth of 300mm.

Courtenay has developed DPA compliance checklists for each of the DPAs for developers and homeowners.[69,70] The City's Engineering Division in the Department of Development Services administrates the requirements. For the DPAs, a security deposit is used to ensure that the rainwater management and topsoil requirements have been met. After professional inspection and approval are complete, the deposit is returned.[68] Courtenay also has a DAI bylaw, which allows the city to request rainwater management information for DPs, rezonings and temporary use permits.[71]

Town of Comox's DPAs, DAI Bylaw, and Neighbourhood Scale Plan

The Town of Comox currently uses DPAs and a DAI bylaw to support rainwater management and is also developing a stormwater management plan for the North East Comox neighbourhood. The primary objectives of Comox's rainwater management requirements are to enhance

ecological and amenity values, protect downstream agricultural lands and reduce the burden on grey infrastructure. Comox has two DPAs that include rainwater management requirements, which apply to ground oriented infill development and multi-family residential development.[72] The rainwater management requirements use a combination of performance-based criteria and prescriptive criteria. On-site source controls should be used to achieve pre-development stormwater flows after development is completed. There is also a landscaping requirement that all pervious areas must meet the British Columbia Society of Landscape Architects' standard, which includes minimum requirements for topsoil depth and composition.[73] Security deposits are used to support enforcement of rainwater source controls and landscaping requirements for development sites located with DPAs where the DAI bylaw applies.[74]

The *North East Comox Neighbourhood Stormwater Management Plan* is being developed in three phases. At present, the first two are complete. Phase one determined the physiographic conditions and hydrologic responses of the plan area based on pre-development (vegetated) conditions. It set out infiltration rate targets for the Queen's Ditch/Lazo catchment for different frequencies of storm events, from the 1 in 2 year event to the 1 in 100 year event, as well as annual averages for runoff and infiltration rates. Phase two established the flow rates and volumes of unmitigated development and phase three will include design standards. Phase two of the plan states that achieving the stormwater management goals will require that the Town of Comox update its subdivision and development servicing bylaw, and potentially other bylaws as well, to include the design standards put forth in the plan.[75]

Village of Cumberland's DPAs and DAI Bylaw

The Village of Cumberland makes use of DPA and DAI bylaw plan implementation tools to improve rainwater management. The objective of Cumberland's rainwater management requirements is to preserve the health and natural function of ecosystems and watersheds, in part by managing rainwater on-site and maintaining pre-development flows. Several DPAs are included in Cumberland's OCP.[76] The DPAs that include rainwater management requirements apply to environmentally sensitive areas and the following land uses: industrial, residential infill, residential multi-family, mixed land use, commercial, intensive residential, and interchange lands. The requirement does apply to new single-family lots at the Carlisle Lane development, for which a specific DPA was created. The 4 ha development area includes a maximum of 80 potential units, which also includes secondary and coach suites. The present development project at Carlisle Lane includes 33 units.[77] Outside of this, the requirements do not apply to single-family home re-developments.

The rainwater management requirements are performance-based. Post-development flows must be maintained to the equivalent of pre-development flow patterns and volumes over the entire wet season. A stormwater management plan must be prepared by a professional engineer. Specific components of the plan can be requested for sites within DPAs using the DAI bylaw.[78] To support enforcement, Cumberland uses section 219 covenants to ensure that the performance of rainwater source controls on private lots is maintained over time.[79]

4.2.2 Leading Local Government Examples

District of Metchosin's Rainwater Management Bylaw

The District of Metchosin's *Bylaw for the Protection and Management of Rainwater* is a leading example of rainwater bylaws in B.C.[80] The bylaw is both progressive and comprehensive. There are seven key principles of the bylaw: ecosystem integrity, sustainability, stewardship, accountability, water quality, public awareness, and property values. The bylaw was spearheaded by planning staff in 2004. At the time of implementation, the district reduced the footprint of its DPA for the Bilston Creek Floodplain and introduced the new bylaw.[81] The benefit of the DPA is limited to a specific area and is primarily only enforced when a development takes place; whereas, the bylaw is in effect across the District and can be implemented indefinitely.

The bylaw applies to all land use in the district, including single-family residential, which accounts for the majority of the land base. The rainwater requirement is trigged by subdivisions, existing property developments, and re-development. When Effective Impervious Area (EIA) exceeds a certain threshold (465sqm on lots less than 0.8 ha and 5% on lots greater than 0.8 ha), a report from a qualified professional is required. Impervious surfaces in existence prior to adoption of the bylaw were considered to be 'grandfathered'; however, the District encourages land owners to address all impervious surfaces as per the bylaw.

The bylaw uses a combination of performance and prescriptive requirements. The rainwater management performance target is to address 90% of rainfall on-site. Rainwater source controls must be used to mimic pre-development rates, based on the peak 6-month design event. Pre-development is defined in the bylaw as "the state of the land before any existing or proposed development". This clarifies that pre-development refers to any development as opposed to prior to a current application. In addition to this performance target, there is a prescriptive topsoil requirement which applies to all areas that previously contained trees and undergrowth and that are to remain as pervious surfaces. A minimum topsoil depth of 300mm for lawn and other landscaped areas is required. Specific requirements for subdivisions are set out for situations where runoff from multiple lots is to be retained. The bylaw includes an explanation of the performance-based approach and detailed information on design criteria, such as a rainwater runoff calculation formula, as well as Rainwater Management Manual in the appendix. The manual includes details on how to meet requirements and checklists to help during the design process. Staff at the District also wrote a Statement of Intent of the bylaw, which explains the purpose of and summarizes the bylaw in easy to understand language.[81]

The rainwater management and topsoil requirements under the bylaw are reviewed by the District staff, including the reporting from professionals. In the cases where EIA on a lot exceeds 5%, an operation and maintenance plan must be prepared by a qualified professional. The bylaw lists the components that must be included in the plan, which includes a schedule for routine inspection. In order to ensure that the rainwater source controls continue to meet the target over time, the infrastructure must be properly maintained. Where reasonably practicable, the bylaw can be used to enforce this.

City of Surrey's Drainage Bylaw

The City of Surrey is one of the leading Metro Vancouver municipalities for rainwater management requirements. Surrey is experiencing rapid population growth and is committed to integrating development with preserving the integrity of its ecosystems.[82] The *East Clayton Neighbourhood Concept Plan* (NCP) was the first development plan in Metro Vancouver to require Low Impact Development (LID) rainwater controls.[83,84] The plan for the 809 ha area was first adopted by Surrey council in 2003. The plan includes objectives to reduce runoff by limiting impervious area coverage and capturing and infiltrating rainwater on-site. It outlines a combination of prescriptive and performance targets. The maximum amount of impervious surfaces permitted per property is 60%. Source controls must be utilized to capture the runoff from the impervious areas on-site, to mimic pre-development volumes and peak flows for 90% of the total annual rainfall events. The source controls that must be implemented in each lot include specific tree planting requirements, a topsoil depth requirement of 600mm in all pervious areas, and infiltration devices that meet the target of infiltrating 12-24mm/day over the total area of the lot.

Furthermore, Surrey also has rainwater management requirements through its ISMPs. Surrey's first ISMPs, Hyland Creek and Cougar Creek, were completed in 2009; and to date, twenty-one have been completed.[85] The infiltration and absorbent landscaping requirements in the ISMPs vary depending on the watershed. Topsoil requirements range from 150mm to 600mm. Some ISMPs use a performance-only approach and do not set out prescriptive requirements. The rainwater management requirements apply to all land use in Surrey, including single-family residential, and any development scenario, including re-development. The requirements under the NCPs and ISMPs are given legal standing through a reference statement in the *Stormwater Drainage Regulation and Charges Bylaw*.[86] Surrey also uses section 219 covenants to help support the maintenance of stormwater infrastructure over time.[87]

Cowichan Valley Regional District's DPAs, Zoning Bylaw, and Subdivision Bylaw

The Cowichan Valley Regional District (RD) uses a variety of plan implementation tools to support rainwater management. OCPs are one of the tools that they use, and they commonly have one for each electoral areas in the regional district. In 2011, however, the OCPs for the South Cowichan electoral areas were amalgamated and updated to become the *South Cowichan OCP*. It includes rainwater management requirements in its DPAs for villages and there are three villages within the plan area, all subject to the DPAs.[88] The DPAs apply to all land use, except for single-family residential dwellings. For properties subject to DPs, rainwater management and landscaping plans are required, and they must be integrated with one another. The requirements of the plans are included in the OCP and use a combination of prescriptive and performance-based approaches. In particular, the plans must outline how runoff from development will not damage roads, surrounding properties, and sensitive watershed features.

Furthermore, they also made changes to the *South Cowichan Zoning Bylaw,* enhancing its ability to support rainwater management. The change was the shift from only having a parcel (building) area limit to also including an impervious surface limit.[89] Therefore, in addition to parcel area, it now includes paved areas and other types of impervious surfaces. The objective of this

change is to limit the amount of rainwater runoff from impervious surfaces. The limits are specific to different types of zoning, ranging from maximums of 12% in the rural areas to 35% for suburban residential homes to 55% for mixed use residential areas and duplexes.[89] Using the zoning bylaw such as this is an example of a prescriptive approach. As the Cowichan Valley RD updates the OCPs and zoning bylaws for their remaining electoral areas, they are likely to incorporate similar requirements to support rainwater management.

Additionally, the Cowichan Valley RD also has a subdivision bylaw, increasing its authority over subdivision approval and also allowing it to create drainage service areas for subdivisions.[90,91] These service areas provide them with the opportunity to enhance rainwater management practices. Finally, similar to the Comox Valley RD, the Cowichan Valley RD has also recently developed the WBME tool to educate the public and support their rainwater management goals.[3]

Metro Vancouver's Region-wide Baseline

The Metro Vancouver Regional District (MVRD) is currently developing minimum requirements for rainwater management on single-lot residential developments as part of the Metro Vancouver *Integrated Liquid Waste and Resource Management Plan* (ILWRMP). In September 2015, the *Options for a Region- Wide Baseline for On-Site Rainwater Management* report was presented to Metro Vancouver municipalities for their feedback.[36] It includes baseline requirements that will apply to areas that have not developed ISMPs and to the land uses that ISMPs have often left out of rainwater management requirements (single-family, duplex, and triplex residential land uses). The options that MVRD presented include combined prescriptive and performance-based requirements. The prescriptive requirements include the disconnection of downspouts, a maximum 70% impervious surface area, a 450mm minimum topsoil depth, and paved areas must either be pervious or direct runoff to appropriate areas. The performance target is to capture and infiltrate 40% of the 2 year, 24-hour storm. In order to meet this target, developments in some areas will require further use of source controls.[92]

The September 2015 report included draft brochures and a draft model bylaw. At present, representatives from Metro Vancouver municipalities are working together to address concerns and refine the proposed bylaw. MVRD has conducted stakeholder engagement with the development, building, and landscape architecture industries and the results will become available throughout 2016.[38]

SECTION 5: CONSIDERATIONS AND RECOMMENDATIONS FOR THE CVRD

5. Considerations and Recommendations for the CVRD

Section 5 covers considerations and recommendations for the CVRD. It includes a criteria analysis of the different plan implementation tools for rainwater management. The criteria by which the appropriateness of the different plan implementation tools are analyzed are first explained, followed by an analysis of the tools. Finally, recommendations for the CVRD's next steps are put forth.

5.1 Rainwater Management Plan Implementation Tool Criteria Analysis

In this section, criteria are used to assess the suitability and effectiveness of different plan implementation tools for rainwater management in the Comox Valley electoral areas. The criteria are grouped into three categories: (1) rainwater management criteria, (2) development scenario criteria, and (3) administration criteria. The criteria are aspects considered to be important to the CVRD's objectives and context. They were compiled through a combination of literature review, the concepts of which are described in the previous sections; the local and leading examples shared above; and focus groups with CVRD staff. This coarse analysis is meant to provide as a first step for the CVRD staff in investigating what plan implementation tool(s) is most appropriate for the CVRD. It is possible that the results of the analysis may shift when the CVRD moves into the next steps. In this section, definitions of the criteria are first provided in Table 3, followed by an analysis of how the different plan implementation tools perform against the criteria. A summary of the rainwater management plan implementation tool criteria analysis is provided below in Table 4.

5.1.1 Assessment Criteria

Rainwater Management Criteria	
Targets are unique to the watershed	Rainwater runoff control and infiltration targets for a property or neighbourhood are specific to the watershed that it is located in.
Requirements can be performance-based	There is flexibility in the source controls that can be used to meet the rainwater runoff control and infiltration targets.
Requirements can be prescriptive	There is a particular source control that must be used.
Can apply to the entire watershed	The rainwater management requirement can apply to the entire watershed, as opposed to being limited to certain parts of the watershed, such as riparian areas.
Different targets for different physiographic zones are possible	It is possible to have different targets for different physiographic zones of the requirement, such as a watershed or sub-watershed.

Development Scenario Criteria	
Triggered by new development	The rainwater management requirement is triggered by new green field development.
Triggered by re-development	The rainwater management requirement is triggered by re-development on a single lot.
Triggered by rezoning	The rainwater management requirement is triggered by the rezoning of a lot.
Triggered by a subdivision – property requirements	The rainwater management requirement is trigged by a subdivision and applies at the property level.
Triggered by a subdivision – neighbourhood requirements	The rainwater management requirement is trigged by a subdivision and applies at the neighbourhood level.

Administration Criteria	
Requirements can be adaptable	Rainwater management requirements can be adapted to allow for scientific advancements and administrative improvements.
Requirements can be enforced long term	Requirements can be enforced over the long term as opposed to only at the time of development.
Enforcement at the time of development can be made as efficient and inexpensive as possible	Enforcement at the time of development refers to the development process and up to approximately two years after building has taken place. Enforcement being as efficient and inexpensive as possible is a relative comparison to the other plan implementation tools.
Long term enforcement can be made as efficient and inexpensive as possible	Long term enforcement refers to the indefinite time period commencing approximately two years after building has taken place. Enforcement being as efficient and inexpensive as possible is a relative comparison to the other plan implementation tools.
Exemptions are possible	Exemptions for development scenarios with minimal or no impact on the watershed are possible.

Table 3. Criteria analysis assessment criteria.

5.1.2 Analysis

Rainwater Management DPA

The rainwater management DPA performs well against the rainwater management criteria, yet has some limitations in the development scenarios it can apply to and in long term enforcement. A rainwater management DPA could require that watershed based targets are met at the property scale. Requirements could be performance-based, prescriptive, or a combination of both. Although DPAs are most commonly used to protect features that are geographically limited, they could also be used to protect a watershed and apply to the entire area.[93] DPAs can be flexible, and allow for different targets to be developed for different physiographic zones within a watershed. A rainwater management DPA that applies to single-family, multi-family, and ICI land uses in the CVRD electoral areas could require a DP for new development and re-development, including single properties within subdivisions. However, it cannot be used to require rainwater management at the neighbourhood scale.

DPAs allow for adaptability, particularly when used in conjunction with a separate guideline. Rainwater management requirements must be explained in the OCP, for example, that a site post-development must meet pre-development runoff and infiltration rates; however, the specific runoff capture and infiltration targets for each watershed can be included in a separate guideline. A separate guideline can also include helpful information on how to reach the targets. This document can be updated to incorporate scientific advancements separately from the OCP update. Enforcement at the time of development can be made as efficient and inexpensive as possible, particularly through a security deposit, which is returned to the property owner when the requirements have been met. Although DPAs technically can be enforced long term through Supreme Court injunction, the process is known to be expensive and time-consuming. Covenants cannot be required as a condition of a DP, but they can for rezoning within DPAs.[54] Therefore, DPAs are limited in their ability to support maintenance of on-site rainwater management source controls on private properties over the long term. Exemptions for developments that have little or no impact to the watershed or for specific land uses, such as ALR lands, are possible.[51] Thus, a rainwater management DPA performs well at the time of development, yet not over the long term.

Inclusion in Other DPAs

Rainwater management requirements can also be included in other DPAs. This is how the CVRD is currently practicing its rainwater management requirements, but it could be expanded to target all regions that are going to see significant land use change. The Mount Washington Mixed Use DPA and Kensington Comprehensive DPA apply to most of the settlement nodes they are located within, but there is presently no DPA providing full coverage in the Saratoga Miracle Beach settlement node. A DPA specific to this settlement with rainwater management requirements could be developed.[4] A DPA could also be developed for infill development, inclusive with rainwater management requirements. Including rainwater management requirements in another DPA may offer a quick-start option for the CVRD, targeting land uses and regions that are likely to result in the greatest impact to the CVRD's watersheds. Asides from the key difference of the rainwater management requirements being included in another DPA as opposed to being the key focus of the DPA, this plan implementation tool performs the same in the three criteria categories as the rainwater management DPA discussed above.

DAI Bylaw

The recently adopted DAI bylaw at the CVRD can be applied in specific development situations and can complement DPAs. The bylaw can allow for specific information to be provided before a development is approved, including how rainwater management requirements will be met and maintained over time. The targets can be watershed based and the CVRD can decide how they would like the targets to be met – through a performance-based approach, prescriptive approach, or a combination of both. A rainwater management plan is required, which can be attached to the property title with a covenant, requiring that the targets are met over time and with different property owners into the future. The DAI is trigged by rezonings and by developments located in DPAs. The requirements can be enforced over the long term at the CVRD's discretion.[63] Exemptions are possible, for example, this tool is primarily for larger scale development scenarios as opposed to routine applications.[94] The CVRD could expand the use of this tool by increasing the coverage of DPA(s) and broadening the scope to include development of all scales.

Rainwater Management Bylaw

A rainwater management bylaw performs well for all criteria, except for neighbourhood scale subdivision development scenarios. Targets can be watershed specific and there can be flexibility regarding how they are met. The requirement can apply to the entirety of watersheds and the targets can be different for different physiographic zones. The requirement can be triggered by new development and re-development, including single lots on subdivisions. This can be achieved by making it a condition of a building permit.[1,51,55,56] It cannot be used to require rainwater management requirements for subdivisions at the neighbourhood scale. The bylaw can allow for adaptability by including the detailed information on targets and how the targets can be met in a separate guideline. For rezonings and phased development agreements, the requirements of the bylaw can be included in a maintenance agreement that can be registered on the property title as a covenant, which can increase the likelihood of maintenance over time.[54] In order for it to be enforceable, the covenant must be monitored. It can be enforced through rent charges or court. The regional district can also set out fines in the bylaw and enforce them in the cases that the maintenance agreement is not met.[95] The strong performance of the rainwater management bylaw against the criteria makes it an effective and administratively efficient plan implementation tool.

Subdivision and Development Servicing Bylaw

The subdivision and development servicing bylaw addresses a gap in the criteria that the other plan implementation tools cannot meet. Partial authority over subdivision approvals in electoral areas can be transferred to regional districts through this bylaw. Rainwater management requirements can be set out for subdivisions at the neighbourhood scale, which is particularly useful on smaller lots where it is challenging to meet the detention and infiltration targets. The targets can be watershed based and there can be flexibility as to how they are met. The requirements could apply to the whole of the electoral areas to address all larger scale subdivisions and there can be different targets for different physiographic zones. This bylaw is specific to subdivisions, and therefore does not apply to single property development, re-development, or rezonings. Meeting the requirements of the bylaw can be made a condition of issuing a building permit for single lots within subdivisions.[1,51,55,56] The rainwater management

target details and resources on how to meet them can be included in a separate guideline that can be updated separately from the bylaw, to allow for scientific advancements. Requirements for single properties can be enforced with security deposits in the short term and covenants over the long term. Requirements at the neighbourhood level can be enforced with development servicing agreements with developers. Once the servicing agreement expires, the regional district is responsible for maintenance at the neighbourhood scale.

Zoning Bylaw

Impervious surface limits through the zoning bylaw perform well for development scenario criteria and some administrative criteria, but not as well for rainwater management criteria. The greatest limitation of this tool is that only prescriptive requirements for impervious surface limits can be used and they are tied to the zoning types. This means that the requirements cannot be specific to the watershed or physiographic zones that the property is located in. A further limitation of this tool is long term enforcement and allowance of exemptions. Since exemptions for small works, such as less than 10sqm, are often permitted, incremental exceedance of the impervious surface limit would be challenging to enforce over the long term. That being said, adding an impervious surface limit to the zoning bylaw would likely be a relatively simple process that could be implemented quickly. It could be used in combination with a plan implementation tool that uses watershed-based targets, but not on its own.

	Rainwater Management Criteria					Development Scenario Criteria					Administration Criteria						
	Targets can be specific to the watershed	Requirements can be performance based	Requirements can be prescriptive	Can apply to the entire watershed	Different targets for different physiographic zones are possible	Triggered by new development	Triggered by re-development	Triggered by rezoning	Triggered by a subdivision - property requirements	Triggered by a subdivision - neighbourhood requirements	Requirements can be adaptable	Requirements can be enforced long term	Enforcement at the time of development can be made as efficient and inexpensive as possible	Long term enforcement can be made as efficient and inexpensive as possible		Exemptions are possible
Rainwater Management DPA	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	*with a security deposit	×	*a covenant can be required for a rezoning or phased development agreement. It increases the likelihood of maintenance, but enforcement can be challenging	✓
Inclusion in Other DPAs	✓	✓	✓	×	✓	✓	✓	✓	✓	×	✓	✓	✓	*with a security deposit	×	*a covenant can be required for a rezoning or phased development agreement. It increases the likelihood of maintenance, but enforcement can be challenging	✓
DAI Bylaw	✓	✓	✓	✓ *DPAs & re-zonings × *No DPA or re-zoning	✓ *DPAs & re-zonings × *No DPA or re-zoning	✓ *DPAs & rezonings × *No DPA or rezoning	✓ *DPAs & rezonings × *No DPA or rezoning	✓	×	×	✓	✓	✓	*with a security deposit	✓	*a covenant can be required for a rezoning or phased development agreement. It increases the likelihood of maintenance, but enforcement can be challenging	✓
Rainwater Management Bylaw	✓	✓	✓	✓	✓	✓ *Such as by making it a condition of a BP	✓ *Such as by making it a condition of a BP	✓	✓ *Such as by making it a condition of a BP	×	✓	✓	✓	*with a security deposit	✓	*a covenant can be required for a rezoning or phased development agreement. It increases the likelihood of maintenance, but enforcement can be challenging *violations can be fined through the bylaw	✓
Subdivision and Development Servicing Bylaw	✓	✓	✓	✓	✓	×	×	×	✓ *Such as by making it a condition of a BP	✓	✓	-	✓	*with a security deposit and covenants for single lots and servicing agreements for neighbourhoods	×	*the regional district is responsible for maintenance after the servicing agreement expires	✓
Zoning Bylaw	×	×	✓	×	×	✓ *Such as by making it a condition of a BP	✓ *Such as by making it a condition of a BP	✓	✓ *Such as by making it a condition of a BP	×	✓	✓	✓		×		✓

Table 4. Rainwater management plan implementation tool analysis summary.

5.2 Recommended Next Steps for the CVRD

It is recommended that the CVRD increase its use of plan implementation tools to support its rainwater management objectives and policies. The following are recommendations for the CVRD to get started. They have been developed through research into best practices, local and leading examples, focus groups with CVRD staff, and from the results of the rainwater management plan implementation tool criteria analysis.

1. Commit to increasing the CVRD's use of plan implementation tools to manage rainwater

a) Create a multi-departmental working group to move forward with the next steps.[93] The working group should include or involve representatives from all departments with a stake in plan implementation tools for rainwater management. In particular, departments that should be involved include Planning, Engineering, and Legal Services. Include the MOTI on matters related to their jurisdiction.

b) Use a watershed-based approach with the objective of mimicking the hydrologic processes in each watershed as they were prior to any development.[24,28]

c) Use a collaborative approach and work with the MOTI, the CVRD municipalities, the K'omox First Nation, and non-governmental organizations (NGOs) using a watershed-based approach – such as through CAVI.[6]

2. Decide which rainwater management plan implementation tool(s) to utilize and develop the tool(s)

a) Utilize a tool, or combination of tools, that has legal power and can be enforced over the long term.

1. Based on the rainwater management plan implementation tool criteria analysis conducted in this research, a rainwater management bylaw is the top recommendation. This is because it performs the best against the greatest number of rainwater management, development scenario, and administration criteria. In particular, it is the most direct tool that can be applied watershed-wide to the majority of development scenarios and practicably be enforced over the long term. To address rainwater management at the neighbourhood scale, a development and subdivision servicing bylaw is also recommended. However, there are additional factors beyond the scope of this research that the CVRD should consider in selecting a plan implementation tool(s). These include, but are not limited to: the development application process, staff capacity, cost to the CVRD, cost to applicants, and collaboration with MOTI. For factors beyond the scope of this research, the CVRD may prefer to utilize other tools, such as the combination of a rainwater management DPA and expanding the scope of the DAI bylaw to include development of all scales. The criteria analysis is meant to provide the first step in investigation of tools within the CVRD's direct authority.

II. Monitor the release of information in regards to the new *Building Act* and how it might affect the CVRD's authority to use these tools. It should not affect administrative requirements; however, may affect technical building requirements.[55,56]

III. The plan implementation tool(s) should apply to most land use at all scales, including single-family lots.

IV. The CVRD should continue to collect security deposits to support enforcement at the time of development and consider the use of covenants to support maintenance over the long term (where they have the authority to do so).[51,53,93,54]

V. Exemptions should apply where appropriate, such as to farm infrastructure and activities deemed to have no impact.

VI. Involve all departments affected by the rainwater management tool in the tool development process.[93]

VII. Ensure the rainwater management requirements do not contradict requirements under other regulations.[96]

VIII. Similarity to the rainwater management plan implementation tool administrative processes of CVRD municipalities should be considered. It may help with uptake from the development, building, and landscaping communities.[96]

IX. Consider interviewing staff in the CVRD municipalities and leading local government examples discussed in this report to collect recommendations regarding administration and enforcement of plan implementation tools.

X. Consider conducting further research on examples of plan implementation tools in B.C. and beyond. Suggestions include:
- Nanaimo Regional District's Subdivision Bylaw
- Squamish Lillooet Regional District's Subdivision Servicing Bylaw
- Columbia Basin Trust's Model Subdivision and Development Servicing Bylaw
- District of Saanich's Stormwater Management Bylaw
- Resort Municipality of Whistler's DPAs
- Local governments in Washington and California

b) Adaptability should be built into the plan implementation tool.

I. It is important that the rainwater management tool is adaptable. Technical requirements and administrative processes may need to be improved and refined over time and it is important to plan for this during the development of the requirement.[53]

c) Use technical tools to support the plan implementation tool.

I. The type of rainwater management requirements used should be context appropriate – performance-based, prescriptive, or a combination of both.

II. The reference to 'pre-development' hydrologic processes in the requirements should be defined as the state of the site prior to any development, rather than a particular development application.

III. The CVRD should utilize the WBME as a technical tool to support the selected plan implementation tool for property scale development scenarios, where it is deemed appropriate.
IV. The CVRD should consider investing in and collaborating to obtain physiographic data to increase the accuracy of rainwater management targets. This may include data for digital elevation, slope, soils, climate, and stream flow. Further data would allow for greater customization of rainwater management targets for the different hydrologic zones within watersheds.[32]
V. The CVRD should continue to require a property scale rainwater management plan for development scenarios where it is deemed necessary.
VI. The CVRD should develop its own rainwater management guideline.
    - This document can be given legal power through reference in a bylaw or DPA.
    - It can be made more accessible and easier to understand than an OCP or a bylaw.
    - It can include clear guidelines on how to meet the rainwater management requirements set out by the CVRD.
    - It can accommodate technical advancements and be updated more easily than a bylaw or DPA.

d) The CVRD should engage with the development, building, and landscaping communities as well as with property owners.[93,97]
   I. Implementation will be more successful if the affected groups are given the opportunity to provide input and offer their expertise. Engagement should be focused on issues that can be resolved to make implementation as simple as possible; for example, on how the rainwater management requirement can be made easy to understand and on the administrative process.

3. Implement the rainwater management plan implementation tool(s)

a) Incorporate the rainwater management requirements into existing administrative development processes at the CVRD as best as possible, as it will help with ease of implementation for both the CVRD and the community.[93]

b) Be clear on roles and responsibilities.[96]
   I. Be clear about the roles and responsibilities of the CVRD departments during the different stages of the development process.
   II. Be clear on the responsibilities of developers and home owners.

c) Produce a checklist to assist with implementation.[51,53,96]
   I. The rainwater management requirement checklist should include all components of the requirement. Different checklists could be developed for different development scenarios and/or land uses.
   II. The rainwater management requirement checklist could be incorporated into a master checklist for the planning department. This will make it clear where the rainwater management requirements fit into the administrative process and bring to light any conflicting requirements that need to be addressed.

d) Educate CVRD staff about the new rainwater management requirements, the benefits of rainwater management, and the objectives of the requirement.[51,53,93]
   I. This will help with uptake by staff and will also be passed on to those that staff communicate with, such as developers and homeowners.

e) Engage and educate the public about the new rainwater management requirements, the benefits of rainwater management, and the objectives of the requirement.[51,53,93]
   I. Create easy to understand educational guidelines specific to affected communities: developers, builders, landscape architects, and home owners. Educating home owners is important for the long term maintenance of rainwater source controls.
   II. Design a process to collect community knowledge about the CVRD's watersheds and hydrologic processes.

4. Evaluate the performance of the rainwater management plan implementation tool(s) and make adaptations if necessary

a) Develop an adaptive management program. This can be done internally, be outsourced, or worked on collaboratively with an NGO or academic institution. It is important to evaluate the requirement to ensure that it is performing as planned to support the CVRD's rainwater management objectives. If it is not performing as planned, then evaluation will help identify what needs to be changed and the requirement can be adapted.[51,53,93]

5. Concurrently move forward with additional means of improving rainwater management in the CVRD

a) Strive for collaborative governance by working with the MOTI, the CVRD municipalities, the K'omox First Nation, and NGOs using a watershed-based approach – such as through CAVI.[6]

b) Continue to explore and move forward with short, medium, and long term recommendations in *A Rainwater Management Strategy* by Fernhill Consulting. In particular, but not limited to:
   I. Potential updates to the Building Bylaw.
   II. Development of a Watershed Management Plan for the Brooklyn Creek Watershed under CAVI.
   III. Review of existing floodplain regulations in light of climate change projects.
   IV. Maintenance of minimum parcel sizes in rural areas.
   V. Creation of a region-wide integrated watershed management strategy as part of a region-wide service area.

c) Investigate the potential implications of the new *Water Sustainability Act.*

d) Further research the additional benefits of improving rainwater management in the Comox Valley, such as water conservation, biodiversity enhancement, and natural capital.

Conclusion

The growing Comox Valley community faces both challenges and opportunities for the future of its watersheds. The CVRD has prioritized the improvement of rainwater management in the electoral areas and has developed strong plan objectives and policies for rainwater management. This report presented and analyzed the plan implementation tools available to the CVRD to translate these high level objectives and policies into actions on the ground and put forth recommendations for the CVRD's next steps. The CVRD has the unique opportunity to plan ahead and integrate development with watershed management, prior to development taking place. If implemented in the near future, rainwater management plan implementation tools are the low hanging fruit to achieve these objectives over the long term.

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APPENDIX A:
LEGAL EXCERPTS

Appendix A: Legal Excerpts

Document: *Local Government Act*

Topic: Designation of development permit areas

Section #: 488

Text:

(1) An official community plan may designate development permit areas for one or more of the following purposes:

a) protection of the natural environment, its ecosystems and biological diversity;

b) protection of development from hazardous conditions;

c) protection of farming;

d) revitalization of an area in which a commercial use is permitted;

e) establishment of objectives for the form and character of intensive residential development;

f) establishment of objectives for the form and character of commercial, industrial or multi-family residential development;

g) in relation to an area in a resort region, establishment of objectives for the form and character of development in the resort region;

h) establishment of objectives to promote energy conservation;

i) establishment of objectives to promote water conservation;

j) establishment of objectives to promote the reduction of greenhouse gas emissions.

(2) With respect to areas designated under subsection (1), the official community plan must

a) describe the special conditions or objectives that justify the designation, and

b) specify guidelines respecting the manner by which the special conditions or objectives will be addressed.

(3) As an exception to subsection (2) (b), the guidelines referred to in that subsection may be specified by zoning bylaw but, in this case, the designation is not effective until the zoning bylaw has been adopted.

(4) If an official community plan designates areas under subsection (1), the plan or a zoning bylaw may, with respect to those areas, specify conditions under which development permit under section 489 would not be required.

Document: *Local Government Act*

Topic: Activities that require a development permit

Section #: 489

Text:

If an official community plan designates areas under section 488 (1), the following prohibitions apply unless an exemption under section 488 (4) applies or the owner first obtains a development permit under this Division:

a) land within the area must not be subdivided;

b) construction of, addition to or alteration of a building or other structure must not be started;

c) land within an area designated under section 488 (1) (a) or (b) [natural environment, hazardous conditions] must not be altered;

d) land within an area designated under section 488 (1) (d), (h), (i) or (j) [revitalization, energy conservation, water conservation, greenhouse gas reduction], or a building or other structure on that land, must not be altered.

Document: *Local Government Act*

Topic: Development permits: general authority

Section #: 490

Text:

(1) Subject to this section, a local government may, by resolution, issue a development permit that does one or more of the following:

a) varies or supplements a land use regulation bylaw or a bylaw under Division 11 [Subdivision and Development: Requirements and Related Matters];

b) includes requirements and conditions or sets standards under section 491 [development permits: specific authorities];

c) imposes conditions respecting the sequence and timing of construction.

(2) The authority under subsection (1) must be exercised only in accordance with the applicable guidelines specified under section 488 in an official community plan or zoning bylaw.

(3) A development permit must not vary the use or density of the land from that permitted in the bylaw except as authorized by section 491 (3) [protection from hazardous conditions].

(4) A development permit must not vary a flood plain specification under section 524 (3).

(5) If a local government delegates the power to issue a development permit under this section, the owner of land that is subject to the decision of the delegate is entitled to have the local government reconsider the matter.

Document: *Local Government Act*

Topic: Development permits: specific authorities

Section #: 491

Text:

(1) For land within a development permit area designated under section 488 (1) (a) [protection of natural environment], a development permit may do one or more of the following:

a) specify areas of land that must remain free of development, except in accordance with any conditions contained in the permit;

b) require specified natural features or areas to be preserved, protected, restored or enhanced in accordance with the permit;

c) require natural water courses to be dedicated;

d) require works to be constructed to preserve, protect, restore or enhance natural water courses or other specified natural features of the environment;

e) require protection measures, including that vegetation or trees be planted or retained in order to

I. preserve, protect, restore or enhance fish habitat or riparian areas,

II. control drainage, or

III. control erosion or protect banks.

(2) For land within a development permit area designated under section 488 (1) (b) [protection from hazardous conditions], a development permit may do one or more of the following:

a) specify areas of land that may be subject to flooding, mud flows, torrents of debris, erosion, land slip, rock falls, subsidence, tsunami, avalanche or wildfire, or to another hazard if this other hazard is specified under section 488 (1) (b), as areas that must remain free of development, except in accordance with any conditions contained in the permit;

b) require, in an area that the permit designates as containing unstable soil or water which is subject to degradation, that no septic tank, drainage and deposit fields or irrigation or water systems be constructed;

c) in relation to wildfire hazard, include requirements respecting the character of the development, including landscaping, and the siting, form, exterior design and finish of buildings and other structures;

d) in relation to wildfire hazard, establish restrictions on the type and placement of trees and other vegetation in proximity to the development.

(3) Conditions and requirements under subsection (2) may vary the use or density of land, but only as they relate to health, safety or protection of property from damage.

(4) Before issuing a development permit for land within a development permit area designated under section 488 (1) (b), a local government may require the applicant to provide a report to assist the local government in determining what conditions or requirements it will impose under subsection (2) of this section.

(5) A report required under subsection (4) must

a) be provided by the applicant at the applicant's expense, and

b) be certified by a professional engineer with experience relevant to the applicable matter.

(6) For land within a development permit area designated under section 488 (1) (c) [protection of farming], a development permit may include requirements for screening, landscaping, fencing and siting of buildings or other structures, in order to provide for the buffering or separation of development from farming on adjoining or reasonably adjacent land.

(7) For land within a development permit area designated under any of the following, a development permit may include requirements respecting the character of the development, including landscaping, and the siting, form, exterior design and finish of buildings and other structures:

a) section 488 (1) (d) [revitalization of commercial use area];

b) section 488 (1) (e) [intensive residential development];

c) section 488 (1) (f) [commercial, industrial or multi-family residential development];

d) section 488 (1) (g) [resort region development].

(8) For land within a development permit area designated under section 488 (1) (f), a development permit may include requirements respecting the character of the development, as referred to in subsection (7) of this section, but only in relation to the general character of the development and not to particulars of the landscaping or of the exterior design and finish of buildings and other structures.

(9) For land within a development permit area designated under section 488 (1) (h), (i) or (j) [energy conservation, water conservation, greenhouse gas reduction], a development permit may include requirements respecting the following in order to provide for energy and water conservation and the reduction of greenhouse gas emissions:

a) landscaping;

b) siting of buildings and other structures;

c) form and exterior design of buildings and other structures;

d) specific features in the development;

e) machinery, equipment and systems external to buildings and other structures.

(10) For land within a development permit area designated under section 488 (1) (h), (i) or (j), a development permit may establish restrictions on the type and placement of trees and other vegetation in proximity to the buildings and other structures in order to provide for energy and water conservation and the reduction of greenhouse gas emissions.

Document: *Local Government Act*

Topic: Building regulation bylaws

Section #: 298

Text: (1) Subject to the *Public Health Act*, the *Drinking Water Protection Act*, the *Fire Services Act* and the regulations under those Acts, the board may, for the purposes described in subsection (2), by bylaw, do one or more of the following:

a) regulate the construction, alteration, repair or demolition of buildings and other structures;

b) regulate the installation, alteration or repair of plumbing including septic tanks and sewer connections, heating, air conditioning, electrical wiring and equipment, gas or oil piping and fittings, appliances and accessories of every kind;

c) require contractors, owners or other persons to obtain and hold a valid permit from the board, or the authorized official, before starting and during the construction, installation, repair or alteration of gas or oil pipes and fittings, plumbing, heating, sewers, septic tanks, drains, electrical wiring, oil burners, tanks, pumps and similar works and buildings and other structures of the kind, description or value described in the bylaw;

d) require that, before occupancy of a building or part of it after construction, wrecking or alteration, or a change in class of occupancy of a building or part of it, an occupancy permit be obtained from the board or the authorized official;

e) establish conditions generally governing the issue and validity of permits and the inspection of works, buildings and other structures;

f) establish areas to be known as fire limits and, for those areas,

I. regulate the construction of buildings in respect of precautions against fire, and

II. discriminate and differentiate between areas in the character of the buildings permitted;

g) regulate the seating arrangements and capacity of churches, theatres, halls and other places of public resort or amusement;

h) regulate or prohibit the moving of a building from one property to another in the regional district;

i) require the fencing of private swimming pools or other pools, existing or prospective, according to specifications set out in the bylaw;

j) regulate the construction and layout of trailer courts, manufactured home parks and camping grounds and require that those courts, parks and grounds provide facilities specified in the bylaw;

k) provide that a trailer or manufactured home must not be occupied as a residence or an office unless its construction and facilities meet the standards specified in the bylaw;

l) require the installation of smoke alarms in existing buildings and other structures and, in relation to this, establish standards and specifications for required smoke alarms and their installation, to the extent that the requirements of the bylaw do not exceed those established by the Provincial building regulations;

m) require the maintenance of smoke alarms installed as required by the Provincial building regulations or by bylaw under paragraph (l) and, in relation to this, establish standards for their maintenance;

n) require the maintenance of "rental units" and "residential property", as those terms are defined in the *Residential Tenancy Act*, that are subject to a "tenancy agreement", as defined in that Act, in accordance with the standards specified in the bylaw, to the extent that the standards do not exceed those established by the Provincial building regulations;

o) require the maintenance of "manufactured homes", "manufactured home sites" and "manufactured home parks", as those terms are defined in the *Manufactured Home Park Tenancy Act*, that are subject to a "tenancy agreement", as defined in that Act, in accordance with the standards specified in the bylaw, to the extent that the standards do not exceed those established by the Provincial building regulations.

(2) A board may exercise the powers conferred by subsection (1) for the following purposes:

a) the provision of access to a building or other structure, or to part of a building or other structure, for a person with disabilities;

b) the conservation of energy or water;

c) the reduction of greenhouse gas emissions;

d) the health, safety or protection of persons or property.

(3) If requested by an applicant, the building inspector must give written reasons for his or her refusal to issue a building permit required under this section.

(4) An occupancy permit required under subsection (1) (d) may be withheld until the building or part of it complies with the following:

a) the Provincial building regulations;

b) bylaws under this section;

c) any other health and safety requirements established by bylaw;

d) any other federal or Provincial enactment in relation to health or safety.

Document: *Local Government Act*
Topic: Zoning bylaws
Section #: 479
Text: (1) A local government may, by bylaw, do one or more of the following:

a) divide the whole or part of the municipality or regional district into zones, name each zone and establish the boundaries of the zones;

b) limit the vertical extent of a zone and provide other zones above or below it;

c) regulate the following within a zone:

I. the use of land, buildings and other structures;

II. the density of the use of land, buildings and other structures;

III. the siting, size and dimensions of

(A) buildings and other structures, and

(B) uses that are permitted on the land;

IV. the location of uses on the land and within buildings and other structures;

d) regulate the shape, dimensions and area, including the establishment of minimum and maximum sizes, of all parcels of land that may be created by subdivision.

(2) The authority under subsection (1) may be exercised by incorporating in the bylaw maps, plans, tables or other graphic material.

(3) The power to regulate under subsection (1) includes the power to prohibit any use or uses in a zone.

(4) A bylaw under this section may make different provisions for one or more of the following:

a) different zones;

b) different uses within a zone;

c) different locations within a zone;

d) different standards of works and services provided;

e) different siting circumstances;

f) different protected heritage properties.

(5) In addition to the authority under subsection (4),

a) provisions under subsection (1) (d) may be different for different areas, and

b) the boundaries of those areas need not be the same as the boundaries of zones created under subsection (1) (a).

Document: *Local Government Act*
Topic: Establishing bylaws required for most services
Section #: 338
Text: (1) Subject to this section, in order to operate a service, the board must first adopt an establishing bylaw for the service in accordance with this Division.

(2) As exceptions, a bylaw under this section is not required to establish the following:

a) general administration, other than electoral area administration;

b) electoral area administration;

c) the undertaking of feasibility studies in relation to proposed services;

d) a service under section 4 (1) [regional district declared regional hospital district] of the *Hospital District Act*;

e) the undertaking of a referendum under section 336 [referendums regarding services];

f) a local community commission under section 243;

g) a service that

I. is a service for which authority is expressly provided by a provision of this Act that is not a former Part 24 provision, and

II. is not a regulatory service;

h) the giving of grants to an applicant for a business promotion scheme under section 215 [business improvement areas] of the *Community Charter* in relation to a mountain resort;

i) if the regional district board is authorized to appoint an approving officer under section 77.1 [appointment of regional district and islands trust approving officers] of the *Land Title Act* , services related to the approving officer.

Document: *Local Government Act*

Topic: Runoff control requirements

Section #: 523

Text: (1) A local government may, by bylaw, require that an owner of land who carries out construction of a paved area or roof area manage and provide for the ongoing disposal of surface runoff and storm water in accordance with the requirements of the bylaw.

(2) A local government may, by bylaw, establish the maximum percentage of the area of land that can be covered by impermeable material.

(3) A bylaw under subsection (1) or (2) may make different provisions for one or more of the following:

a) different zones;

b) different uses in zones;

c) different areas in zones;

d) different sizes of paved or roof areas;

e) different terrain and surface water or groundwater conditions.

Document: *Local Government Act*

Topic: Special drainage and sewerage authority

Section #: 306

Text: A board may, by bylaw,

a) regulate and prohibit the design and installation of drainage and sewerage works provided by persons other than the regional district, and

b) require owners of real property to connect their buildings and structures to the appropriate sewer or drain connections in the manner specified in the bylaw.

Document: *Local Government Act*

Topic: Requirements respecting drainage works

Section #: 312

Text: (1) In this section and section 313, "stream" has the same meaning as section 1 (1) of the *Water Sustainability Act.*

(2) A board may, by bylaw,

a) establish requirements that must be met by owners of dikes, and

b) establish requirements that must be met by persons undertaking the construction of

I. dikes,

II. works to maintain the proper flow of water in a stream, ditch, drain or sewer in the regional district, or

III. works to reclaim or to protect part of the land mass of the regional district from erosion by action of the sea or a stream or from any other cause.

Document: *Local Government Act*

Topic: Screening and landscaping to mask or separate uses

Section #: 527

Text: (1) A local government may, by bylaw, require, set standards for and regulate the provision of screening or landscaping for one or more of the following purposes:

a) masking or separating uses;

b) preserving, protecting, restoring and enhancing the natural environment;

c) preventing hazardous conditions.

(2) A bylaw under subsection (1) may set different requirements, standards and regulations for one or more of the following:

a) different zones;

b) different uses within a zone;

c) different locations within a zone.

Document: *Local Government Act*

Topic: Subdivision servicing requirements

Section #: 506

Text: (1) A local government may, by bylaw, regulate and require the provision of works and services in respect of the subdivision of land, and for that purpose may, by bylaw, do one or more of the following:

a) regulate and prescribe minimum standards for the dimensions, locations, alignment and gradient of highways in connection with subdivisions of land;

b) require that, within a subdivision, highways, sidewalks, boulevards, boulevard crossings, transit bays, street lighting or underground wiring be provided, located and constructed in accordance with the standards established by the bylaw;

c) require that, within a subdivision, a water distribution system, a fire hydrant system, a sewage collection system, a sewage disposal system, a drainage collection system or a drainage disposal system be provided, located and constructed in accordance with the standards established in the bylaw.

(2) A bylaw under subsection (1) may be different in relation to one or more of the following:

a) different circumstances;

b) different areas;

c) different land uses;

d) different zones;

e) different classes of highways.

(3) A local government must not impose a requirement under subsection (1) (b) or (c) in respect of a subdivision under the *Strata Property Act*

(4) The minister responsible for the administration of the *Transportation Act* may make regulations requiring approval of that minister before the adoption of a bylaw under subsection (1) (a) or (b) that establishes standards or requirements in relation to highways in an area outside a municipality.

(5) A regulation under subsection (4) may be different in relation to one or more of the following:

a) different bylaws;

b) different classes of bylaws;

c) different regional districts;

d) different areas;

e) different circumstances.

(6) If a local government, an improvement district or greater board operates

a) a community water or sewer system, or

b) a drainage collection or disposal system,

the local government may, by bylaw, require that a system referred to in subsection (1) (c) be connected to the local government, improvement district or greater board system, in accordance with standards established in the bylaw.

(7) If there is no community water system, the local government may, by bylaw, require that each parcel to be created by the subdivision have a source of potable water having a flow capacity at a rate established in the bylaw.

(8) As a condition of

a) the approval of a subdivision, or

b) the issue of a building permit,

a local government may require that the owner of the land provide works and services, in accordance with the standards established in a bylaw under this section, on that portion of a highway immediately adjacent to the site being subdivided or developed, up to the centre line of the highway.

(9) As a condition of the issue of a building permit, a local government may require that the owner of the land provide, on the site being developed, works and services in accordance with the standards established in a bylaw under this section.

(10) Requirements under subsections (8) and (9)

a) may be made only to the extent that they are directly attributable to the subdivision or development, and

b) must not include specific services that are included in the calculations used to determine the amount of a development cost charge, unless the owner agrees to provide the services.

(11) If the owner agrees to provide the services referred to in subsection (10) (b), the calculation of the development cost charge is subject to section 565 (2) to (5) [deductions from development cost charges].

Document: *Local Government Act*

Topic: Development approval information

Section #: 484

Text: For the purposes of this Division, "development approval information" means information on the anticipated impact of a proposed activity or development on the community, including, without limiting this, information regarding impact on such matters as the following:

a) transportation patterns including traffic flow;

b) local infrastructure;

c) public facilities including schools and parks;

d) community services;

e) the natural environment of the area affected.

Document: *Local Government Act*

Topic: Development approval information areas or circumstances

Section #: 485

Text: (1) An official community plan may do one or more of the following for the purposes of this Division:

a) specify circumstances in which development approval information may be required under this Division;

b) designate areas for which development approval information may be required under this Division;

c) designate areas for which, in specified circumstances, development approval information may be required under this Division.

d) (2) An official community plan that specifies circumstances or designates areas under subsection (1) must describe the special conditions or objectives that justify the specification or designation.

Document: *Local Government Act*

Topic: Bylaw authority in relation to development approval information

Section #: 486

Text: (1) If an official community plan includes a provision under section 485 (1), the local government must, by bylaw, establish procedures and policies on the process for requiring development approval information under this Division and the substance of the information that may be required.

(2) A bylaw under subsection (1) may authorize an officer or employee to require development approval information under this Division.

(3) A bylaw under subsection (1) that authorizes an officer or employee to require development approval information under this Division must establish procedures regarding applying for and dealing with a reconsideration under section 487 (4).

Document: *Local Government Act*

Topic: Requirement to provide development approval information

Section #: 487

Text: (1) Subject to subsection (3), if a bylaw under section 486 is adopted, the local government or an officer or employee authorized by the bylaw may require an applicant for any of the following to provide development approval information to the local government:

a) an amendment to a zoning bylaw;

b) a development permit;

c) a temporary use permit.

(2) Development approval information required under subsection (1) must be provided at the applicant's expense and in accordance with the procedures and policies established under section 486 (1).

(3) Development approval information is not required under this Division if the proposed activity or development is a reviewable project as defined in section 1 of the Environmental Assessment Act .

(4) An applicant subject to a decision of an officer or employee under section 486 (2) is entitled to have the local government reconsider the matter without charge.

Document: *Local Government Act*

Topic: Bylaw enforcement: fines and other penalties

Section #: 413

Text: (1) A board may make bylaws for

a) the purposes of enforcing the bylaws of the regional district by fine, by imprisonment or both, and

b) imposing fines, penalties and costs.

(2) Section 261 [payment of fines and other penalties] of the *Community Charter* applies to regional districts.

Document: *Community Charter*

Topic: Payment of fines and other penalties to municipality

Section #: 261

Text: Fines and other penalties imposed and collected under or because of a municipal bylaw must be paid to the municipality.

Document: *Local Government Act*

Topic: Requirement for security as condition of land use permit

Section #: 502

Text:

(1) For the purposes only of subsections (2) and (3), a local government may, as a condition of the issue of a land use permit, require that the applicant for the permit provide security in an amount stated in the permit by whichever of the following the applicant chooses:

a) an irrevocable letter of credit;

b) the deposit of securities in a form satisfactory to the local government.

(2) Subsection (3) applies if a local government considers that any of the following applies:

a) a condition in a permit respecting landscaping has not been satisfied;

b) an unsafe condition has resulted as a consequence of a contravention of a condition in a permit;

c) damage to the natural environment has resulted as a consequence of a contravention of a condition in a permit.

(3) In the circumstance referred to in subsection (2), the local government may

a) undertake, at the expense of the holder of the permit, the works, construction or other activities required to satisfy the landscaping condition, correct the unsafe condition or correct the damage to the environment, and

b) apply the security under subsection (1) in payment of the cost of the works, construction or other activities, with any excess to be returned to the holder of the permit.

(4) Interest earned on the security provided under subsection (1) accrues to the holder of the permit and must be paid to the holder immediately on return of the security or, on default, becomes part of the amount of the security.

(5) If a local government delegates the power to require security under subsection (1), the delegation bylaw must include guidelines for the delegate as to how the amount of security is to be determined.

Document: *Local Government Act*

Topic: Completion of required works and services

Section #: 509

Text:

(1) Subject to subsection (2), all works and services required to be constructed and installed at the expense of the owner of the land being subdivided or developed must be constructed and installed to the standards established in the bylaw under section 506 [subdivision servicing requirements] before the approving officer approves of the subdivision or the building inspector issues the building permit.

(2) Approval may be given or the permit issued if the owner of the land

a) deposits, with the municipality or regional district, security

I. in the form and amount established in the bylaw under section 506, or

II. if no amount and form is established in the bylaw, in a form and amount satisfactory to the approving officer or building inspector having regard to the cost of installing and paying for all works and services required under the bylaw, and

b) enters into an agreement with the municipality or regional district to construct and install the required works and services by a specified date or forfeit to the municipality or regional district the amount secured under paragraph (a).

(3) As a restriction, security may not be provided under subsection (2) to a regional district in relation to the construction of a highway unless a designated highways official, as defined in the *Land Title Act*, approves the provision of security for that purpose.

Document: *Land Title Act*

Topic: Registration of covenant as to use and alienation

Section #: 219

Text: (1) A covenant described in subsection (2) in favour of the Crown, a Crown corporation or agency, a municipality, a regional district, the South Coast British Columbia Transportation Authority, or a local trust committee under the *Islands Trust Act*, as covenantee, may be registered against the title to the land subject to the covenant and is enforceable against the covenantor and the successors in title of the covenantor even if the covenant is not annexed to land owned by the covenantee.

(2) A covenant registrable under subsection (1) may be of a negative or positive nature and may include one or more of the following provisions:

a) provisions in respect of

I. the use of land, or

II. the use of a building on or to be erected on land;

b) that land

I. is to be built on in accordance with the covenant,

II. is not to be built on except in accordance with the covenant, or

III. is not to be built on;

c) that land

I. is not to be subdivided except in accordance with the covenant, or

II. is not to be subdivided;

d) that parcels of land designated in the covenant and registered under one or more indefeasible titles are not to be sold or otherwise transferred separately.

(3) A covenant described in subsection (4) in favour of

a) the Crown or a Crown corporation or agency,

b) a municipality, a regional district, the South Coast British Columbia Transportation Authority or a local trust committee under the *Islands Trust Act*, or

c) any person designated by the minister on terms and conditions he or she thinks proper,

as covenantee, may be registered against the title to the land subject to the covenant and, subject to subsections (11) and (12), is enforceable against the covenantor and the successors in title of the covenantor even if the covenant is not annexed to land owned by the covenantee.

(4) A covenant registrable under subsection (3) may be of a negative or positive nature and may include one or more of the following provisions:

a) any of the provisions under subsection (2);

b) that land or a specified amenity in relation to it be protected, preserved, conserved, maintained, enhanced, restored or kept in its natural or existing state in accordance with the covenant and to the extent provided in the covenant.

(5) For the purpose of subsection (4) (b), "amenity" includes any natural, historical, heritage, cultural, scientific, architectural, environmental, wildlife or plant life value relating to the land that is subject to the covenant.

(6) A covenant registrable under this section may include, as an integral part,

a) an indemnity of the covenantee against any matter agreed to by the covenantor and covenantee and provision for the just and equitable apportionment of the obligations under the covenant as between the owners of the land affected, and

b) a rent charge charging the land affected and payable by the covenantor and the covenantor's successors in title.

(7) If an instrument contains a covenant registrable under this section, the covenant is binding on the covenantor and the covenantor's successors in title, even though the instrument or other disposition has not been signed by the covenantee.

(8) No person who enters into a covenant under this section is liable for a breach of the covenant occurring after the person has ceased to be the owner of the land.

(9) A covenant registrable under this section may be

a) modified by the holder of the charge and the owner of the land charged, or

b) discharged by the holder of the charge by an agreement or instrument in writing the execution of which is witnessed or proved in accordance with this Act.

(9.1) A covenant that was required as a condition of subdivision under section 82 and registered under this section before the coming into force of the repeal of section 82 may be

a) modified by the approving officer and the owner of the land charged, or

b) discharged by the approving officer.

(9.2) For the purpose of determining whether to modify or discharge a covenant under subsection (9.1), an approving officer may exercise the powers provided under section 86 (1) (d), whether or not the modification or discharge is related to an application for subdivision approval.

(10) The registration of a covenant under this section is not a determination by the registrar of its enforceability.

(11) On the death or dissolution of an owner of a covenant registrable under subsection (3) (c), the covenant ceases to be enforceable by any person, including the Crown, other than

a) another covenantee named in the instrument creating the covenant, or

b) an assignee of a covenantee if the assignment has been approved in writing by the minister.

(12) If a covenantee or assignee referred to in subsection (11) is a corporation that has been dissolved and subsequently restored into existence under an enactment of British Columbia, the covenant continues to be enforceable by the restored corporation from the date of its restoration.

(13) A recital in a covenant that a person "has been designated by the minister under section 219 (3) (c) of the *Land Title Act*", or a statement to that effect in the application to register the covenant, is sufficient proof to a registrar of that fact.

(14) The minister may delegate to the Surveyor General the minister's powers under subsections (3) (c) and (11) (b).

APPENDIX B:

EXAMPLES OF RAINWATER MANAGEMENT PLAN IMPLEMENTATION TOOL LANGUAGE AND MAPS

Appendix B: Examples of Rainwater Management Plan Implementation Tool Language and Maps

City of Courtenay

Document: *Official Community Plan* (2016)
Topic: Environment Section Water Balance Model and topsoil requirement language
Page #: 53
Text: Water Balance Model

The City is a member of the Water Balance Model of BC. This Model promotes a watershed-based approach that manages the natural environment and the built environment as integrated components of the same watershed. The focus is on how to design and build residential communities and industrial/commercial developments that reduce stormwater runoff volumes and function hydro-logically as though still forested. This will lead to the application of development practices which will lower the costs and maximize the benefits to landowners, while providing increased protection to the environment.

The Model assists the City to integrate land use planning with volume-based analysis of stormwater management practices. These strategies will include returning rainfall to the ground using filtration facilities, using soils and vegetation to retain stormwater, and managing rainwater for re-use within the development.

1. The City will require a minimum depth of 300 mm of topsoil or amended organic soil on all landscaped areas, lawns and groundcover, a depth of 450 mm for shrubs and 300 mm around and below the root ball of all trees of a property. This will also be required in all new subdivisions.
2. The City will implement the Water Balance Model of BC to manage the natural environment and the built environment as integrated components of the same watershed.

Document: *Official Community Plan* (2016)
Topic: Development Permit Area (DPA) Water Balance Model Requirement
Page #: 79
Text: The City of Courtenay shall require an applicant to supply a drainage plan, complete with recommendations for implementation that address water quality, water quantity and erosion control that are satisfactory to the City, where applicable, so as to minimize impacts on fish habitat and to comply with the City's stormwater management policies and plans and the City's Water Balance Model.

It is City policy to limit the peak run off from areas of new development to that which the same catchment areas would have generated under the pre-development land use. A storm water management plan will be required as part of any development and shall be prepared by a Professional Engineer to comply with the City's stormwater management policies and plans and the City's Water Balance Model.

Document: *Official Community Plan* (2016)
Topic: DPA Topsoil Requirement language
DPAs with topsoil requirements:

- Downtown Development
- Commercial Development
- Shopping Centre
- Industrial
- Multi-residential
- Intensive Residential (this DPA includes the integration of new housing into existing neighbourhoods, but has not been used to date)
- Old Orchard and Area (this DPA regulates the development of the Old Orchard and Area local area and has been utilized)

Page #: 78-128
Text: The City will require the following minimum depth of topsoil or amended organic soils on all landscaped areas of a property. (a) shrubs – 450 mm (b) groundcover & grass – 300 mm (c) trees – 300 mm around and below the root ball

Document: Intensive Residential Development Permit Checklist and Downtown Development Permit Checklist
Topic: DPA Compliance Checklist Language
Page #: 2
Text: The City will require the following minimum depth of topsoil or amended organic soils on all landscaped areas of a property:

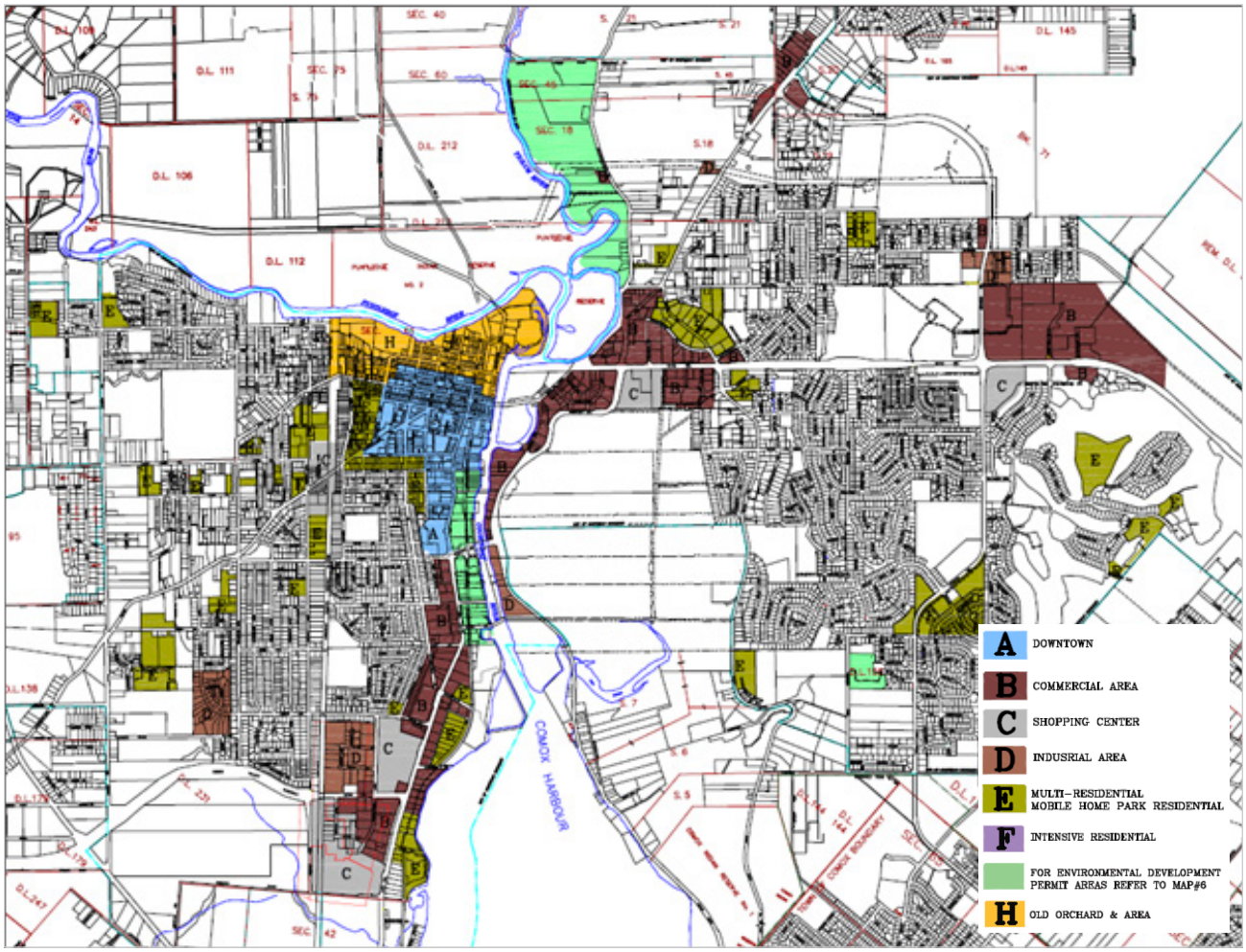
- shrubs – 450 mm
- groundcover & grass – 300 mm
- trees – 300 mm around and below the root ball

Document: DPA Map

Topic: The map below portrays the location of the DPAs in Courtenay. Note that the language in the OCP for DPAs states that in addition to these lands any application for multi-family residence, commercial, industrial, and environmentally sensitive areas require the issuance of a DP whether they are included in the map or not.

Page #: 2

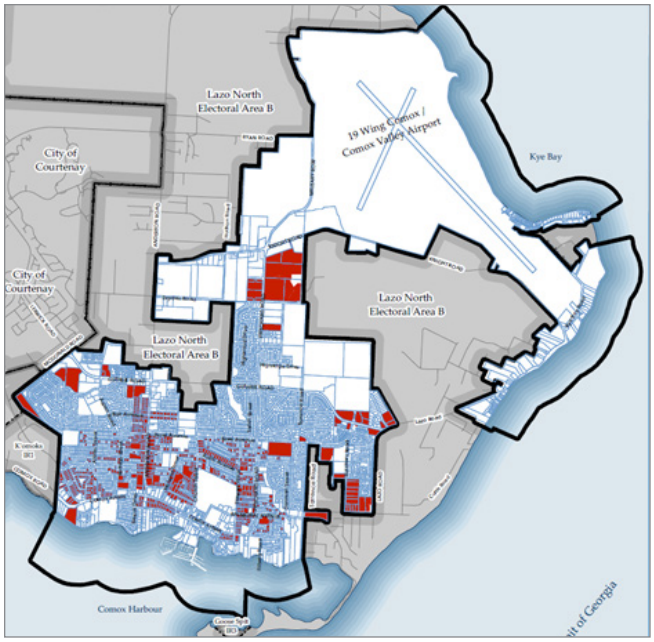
Map:



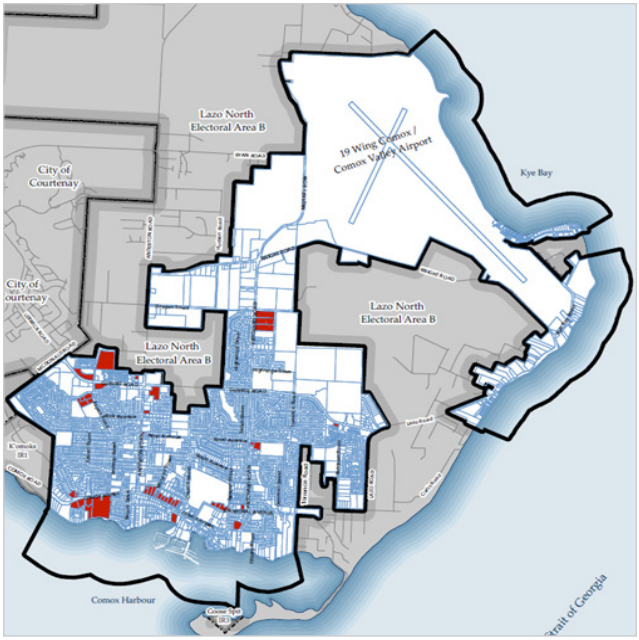
Town of Comox

Document: *Official Community Plan* (2011)
Topic: Ground Oriented Infill and General Multi-Family DPA rainwater management requirement language and maps
Page #: 117,123
Text: On-site mitigation measures should be provided so that post-development hydrology (runoff and infiltration) reflects pre-development hydrology.
Maps:

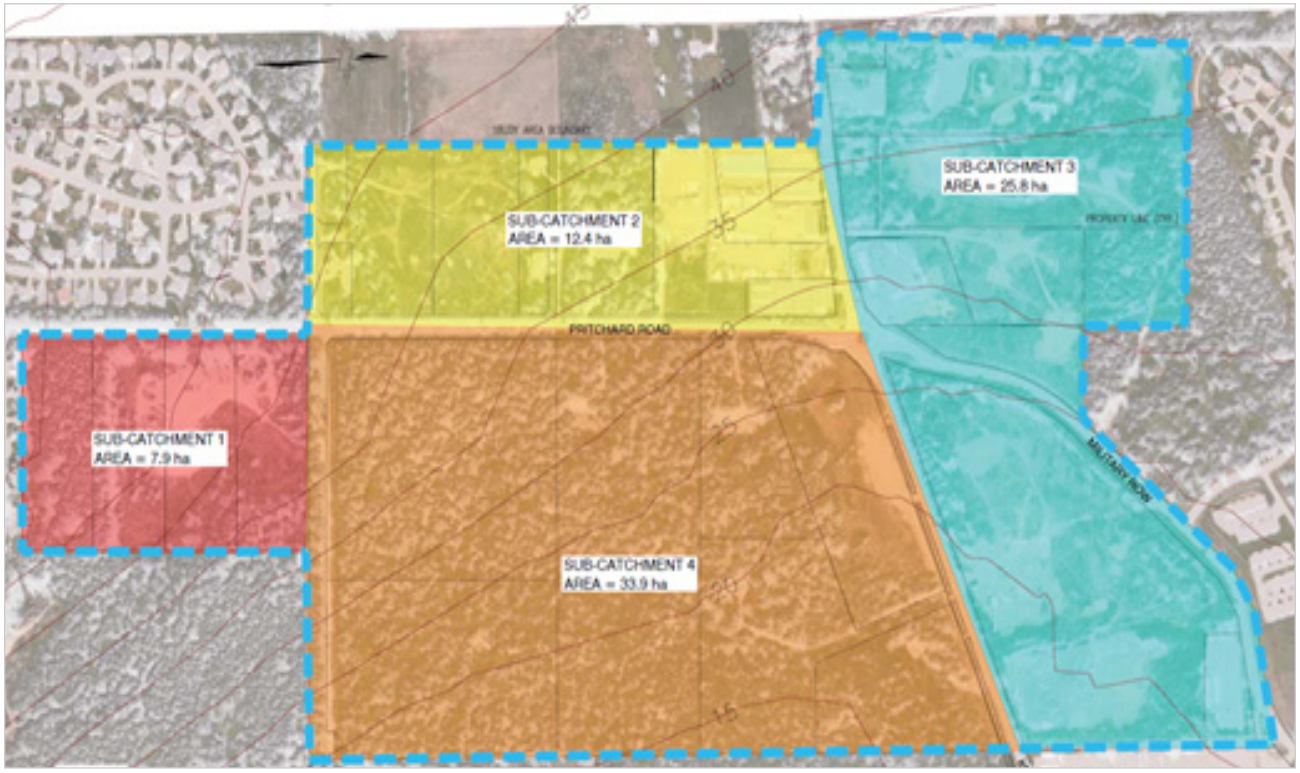
Ground Oriented Infill DPA



General Multi-Family DPA



Document: *North East Comox Neighbourhood Stormwater Management Plan* Map
Topic: Map of plan coverage
Page #: Appendix B
Map:



Village of Cumberland

Document: *Official Community Plan* (2014)
Topic: Environmental Protection DPA rainwater management requirement language and map
Page #: 96-97
Text: 2) The bio-inventory should be prepared by a qualified professional biologist together with other professionals of different and relevant expertise, as the project warrants.

3) The bio-inventory shall:

b. Locate the parcel relative to watershed area(s) and describe the hydrological features of the parcel—including water shedding, collecting and conveyance areas

g. Examine pre-development water quality and quantity on the site and provide mitigation and enhancement strategies to maintain pre development water quality and quantity for the restricted development zones and buffer areas

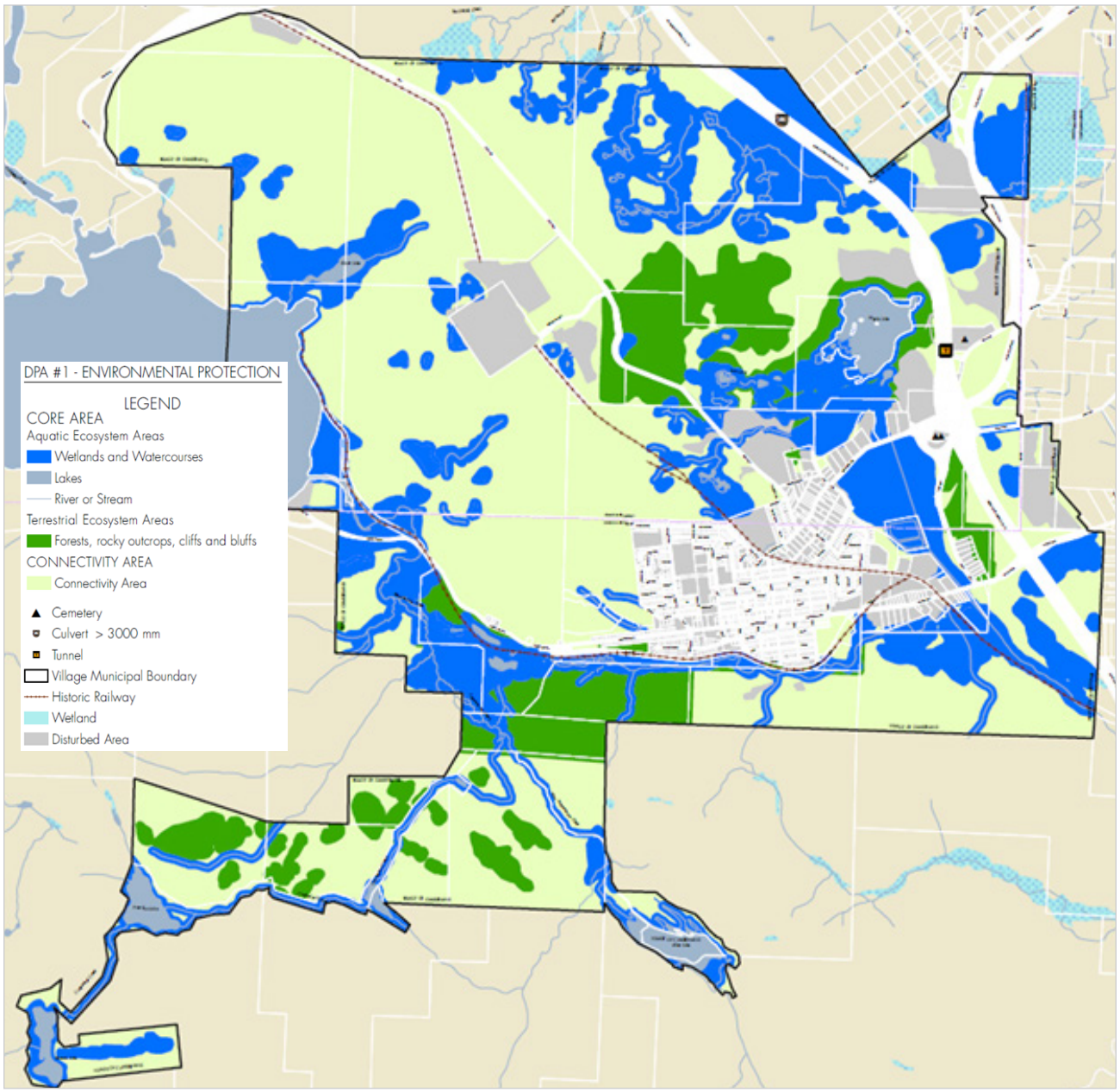
h. Examine the impact of the proposed development on the larger watershed area(s) including watercourses, habitat connectivity, water quality and quantity upstream and downstream, and possible cumulative hydrological impacts that may result; and provide development pattern and servicing recommendations to minimize them

4) The detailed bio-inventory is used to create the site plan. The site plan and development design must include:

a. Detailed drawings or plans clearly describing the proposed structures and the materials and type of construction to be employed, including a cross section of the proposed structure and its layout on the ground

h. A description of how environmental protection DPA requirements will be met, and how any issues identified in the bio-inventory will be mitigated, and how recommended mitigation measures will be achieved

Map:


DPA #1 - ENVIRONMENTAL PROTECTION
LEGEND
CORE AREA
Aquatic Ecosystem Areas
Wetlands and Watercourses
Lakes
River or Stream
Terrestrial Ecosystem Areas
Forests, rocky outcrops, cliffs and bluffs
CONNECTIVITY AREA
Connectivity Area
Cemetery
Culvert > 3000 mm
Tunnel
Village Municipal Boundary
Historic Railway
Wetland
Disturbed Area

Document: *Official Community Plan* (2014)

Topic: DPA maps and rainwater management requirement language in the following DPAs:

- Industrial
- Residential Infill
- Residential Multi Family
- Mixed Land Use
- Commercial
- Intensive Residential – Carlisle Lane
- Interchange Lands

Page #: 96-97

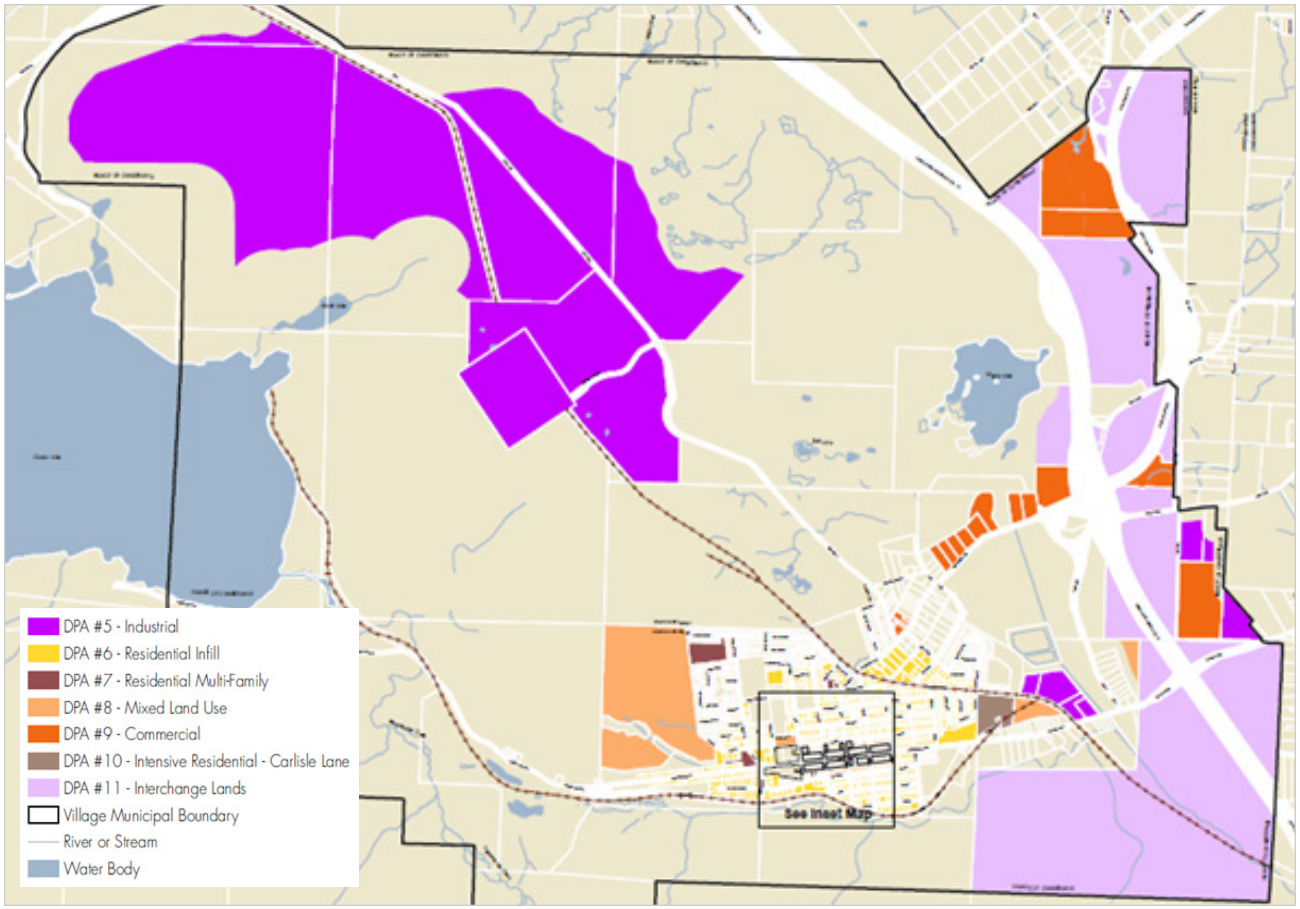
Text: 10) Stormwater

a. A stormwater management plan shall be required as prepared by a registered professional engineer that has as its goal the maintenance of post-development flows equivalent to those of pre-development flow patterns and volumes over the entire wet weather season

b. Stormwater management shall follow source control (on-site) principles and practices and minimize the use of conventional pipe and pond techniques, and avoid direct discharges to streams and other water-bodies

c. Stormwater management shall take advantage of on-site opportunities to recycle water to absorbent soils, wetlands, and forests

Map:



District of Metchosin

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Application and purpose of the bylaw
Page #: 3
Text: 1.1 APPLICATION

1.1.1 This Bylaw applies to all lands within the District of Metchosin. The Bylaw provides regulations for the use and development of land that minimizes the impact on a watershed by emphasizing the conservation and balance of water in and over the land.

1.1.2 A visual flow chart of the steps required pursuant to this Bylaw is attached as Chart A.1 in Appendix A. Where this Bylaw and Chart A.1 appear to conflict, this Bylaw shall take precedence.

1.2 PURPOSE

1.2.1 The purpose of this Bylaw is to provide for the protection and effective management of rain water and drainage, to maintain and improve water quality in watercourses, water bodies, and Riparian-wetland Areas, and to protect the Proper Functioning Condition of watercourses, water bodies, and Riparian-wetland Areas throughout the District of Metchosin.

1.2.2 The Bylaw intends to achieve and employ the following principles:

(1) Ecosystem Integrity - aims to take a long-term, holistic approach to water management, to conserve and protect it for all its many uses, users and values, so as to ensure the protection of property and habitat.

(2) Sustainability - water resources should not be used beyond their capacity to be naturally replenished, both in quality and quantity.

(3) Stewardship - strives for a commitment between all users of rain water to share responsibility for the resource.

(4) Accountability - promotes the conservation of water as a limited resource, and the accountability of its users to accept that the use of rain water is a privilege and should be treated with care and respect, and with consideration for other users.

(5) Water Quality - water quality should be maintained through planning and proactive source controls to eliminate or reduce pollutants, rather than as a reactive response to environmental damage.

(6) Public Awareness - promotes action through awareness and involvement at all levels of the community.

(7) Property Values - protects and supports the rights of property owners to use and manage their land to the maximum extent coincident with the protection and management of rain water over that land.

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Pre-development definition
Page #: 7
Text: Pre-development means the state of land before any existing or proposed development.

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Runoff rates and volumes
Page #: 8-19
Text: 3.3 RUNOFF RATES AND VOLUMES

3.3.1 The quantity of rain water leaving the site after development shall be equal to or less than the quantity of rain water leaving the site before development, to the maximum extent practicable, to achieve the following performance targets: (1) Impervious Surfaces shall be designed to drain at least 90% of the rain water runoff volumes entering the lot for any storm event to the natural hydrologic pathways at the site within the same lot (i.e. through infiltration and other source controls), such that not more than 10% of the total rain water runoff volume crosses any lot line at post-development; (2) The rate of pre-development rain water runoff from the lot shall be maintained at all times to ensure stream flow rates do not exceed those rates corresponding with the natural Mean Annual Flood, and that this maximum rate will occur not more than once per year; and (3) The use of channels, swales, drainageways or other Drainage Facilities for conveying, transporting, storing or infiltrating rain water overland across lot boundaries is not permitted.

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Operations and maintenance requirements
Page #: 22
Text: 3.7 OPERATIONS AND MAINTENANCE REQUIREMENTS

3.7.1 In cases where the Effective Impervious Area coverage on a lot is 5% or greater, all new development, redevelopment, subdivision, site plans, building permits or public works projects, as a condition of approval, shall be required to submit an Operation and Maintenance (O&M) plan prepared by the Qualified Professional for the required rain water quality and quantity control facilities for review by the Clerk.

3.7.2 The information required in the O&M plan shall satisfy the standards for O&M contained in Appendix A - the Rain Water Management Manual. The O&M Plan shall include and not be limited to:
(1) Design plans of the specific facility and related parts, including design assumptions;

(2) A schedule for routine inspection, including post storm related inspections;
(3) A description of the various facility components, the observable trigger for maintenance, and the method of maintenance, including appropriate method of disposal of materials;
(4) The intended method of providing financing to cover future operations and maintenance; and
(5) Contact information for the party or parties that will be responsible for the maintenance of the facility, including the means of effecting contact for emergency situations.

3.7.3 A maintenance log is required, maintained by the Owner, for any rain water management facility used for detention. The log shall provide a record of all site maintenance related activities. The log shall include the time and dates of facility inspections and specific maintenance activities. The log shall be available to the District upon request.

3.7.4 Failure to properly operate or maintain a rain water management facility required under this Bylaw to address water quality or quantity controls in accordance with the O&M plan may result in a civil penalty as specified in Section 5.1.

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Absorbent landscaping
Page #: 27
Text: 4.5 ABSORBENT LANDSCAPING

4.5.1 Unless the Qualified Professional indicates to the Clerk that this requirement cannot be met to the District's satisfaction, absorbent landscaping techniques, as set out in Section 6 of Appendix A, will be used on all development sites to mimic natural vegetated areas, so that the landscaping results in no net change in the hydrologic response for all on-site pervious areas.

4.5.2 Where clearing is proposed of areas that supported forest and undergrowth, and these areas are to remain as pervious surfaces (e.g. grassed or landscaped), a minimum depth of absorbent soil shall be provided which meets the BC Landscape Standard for medium or better landscape. The range of acceptable soil textures is provided as follows:

- sand: 55 - 90%
- silt/clay: 5 - 25%
- organic matter: 5 - 20%

4.5.3 The minimum depth of absorbent soil shall be 300 mm under grassed, turfed and other landscaped areas.

Document: *Rain Water Protection and Management Bylaw* No. 467
Topic: Administration and enforcement
Page #: 28
Text: 5.1 ADMINISTRATION AND ENFORCEMENT

5.1.1 No land, building, structure, or any part thereof shall be developed, used, occupied, sited, erected or altered unless such use, occupation, siting, or erection complies with this Bylaw.

5.1.2 The Clerk or a person designated by Council shall administer this Bylaw. Where the "Clerk" is used herein it includes any person designated by Council to administer this Bylaw.

5.1.3 Metric figures are used in this Bylaw. Imperial figures may be shown for convenience only as approximate equivalents to the metric figures.

5.1.4 By the enactment, administration or enforcement of this Bylaw, the District does not represent to any person that any building or structure, including a mobile home, located, constructed or used in accordance with the regulations of this Bylaw or in accordance with any advice, information, direction or guidance provided by the District in the course of the administration of this Bylaw will not be damaged by flooding.

5.1.5 The Clerk, an employee of the District authorized by the Clerk, or a bylaw enforcement officer may enter at all reasonable times in accordance with Section 16 of the Community Charter, on any property that is subject to this Bylaw, to ascertain whether the regulations of this Bylaw are being observed or the requirements of this Bylaw are being met.

5.1.6 A person who contravenes this Bylaw by doing an act that it forbids, or by omitting to do an act that it requires to be done, commits an offence and is liable to a fine of not more than two thousand five hundred dollars ($2500.00) and not less than one hundred dollars ($100.00) per occurrence of the offence. Each day that an offence continues may be considered as a separate offence. The penalties imposed under this subsection supplement and are not a substitute for any other remedy to an infraction of this Bylaw.

Document: *Rain Water Protection and Management Bylaw* No. 467 (Appendix)
Topic: Design Approaches
Page #: 43-44
Text: Two approaches can be used to design Rain Water Management Facilities under this chapter: Presumptive or Performance.

5.2.1 Presumptive Approach

Each of the methods described in this section is classified as "presumptive," meaning that if the design requirements are followed, the facility is presumed to be in compliance with pollution reduction and/or flow control requirements. The presumptive approach provides detailed engineering requirements for designing detention ponds, treatment wetlands, grassy swales, structural underground detention facilities, and infiltration sump systems. The following Rain Water Management Facilities are typical of a presumptive approach:

- Grassy Swales
- Detention Ponds (Wet, Extended Wet, and Dry Detention)
- Constructed Treatment Wetlands
- Detention Tanks, Vaults, and Oversized Pipes
- Private Drywell and Public Infiltration Sump Systems
- Manufactured Rain Water Treatment Technologies
- Oil-water Separators
- Rain water Re-use

5.2.2 Performance Approach

The list of accepted Rain Water Management Facilities is continually changing as new products are developed and more is learned about the performance of Rain Water Management Facilities already in use. The design professional may propose Rain Water Management Facilities other than those included in this manual by using the performance approach. The performance approach requires detailed engineering design and calculations, as well as documented evidence of the proposed design's performance. The District would accept the proposed design for meeting pollution reduction requirements if the design professional demonstrates that it:

- Will perform at the required efficiency and provides acceptable documentation outlining the criteria for required testing protocol, related definitions, and additional requirements, as requested by the District. Documented performance is required and shall include published data, with supporting cited research, demonstrating removal of target pollutants at required minimum levels.
- Can be efficiently maintained to perform at the required level;
- For public facilities, will not require more costly maintenance than facilities designed using the simplified or presumptive approach.

City of Surrey

Document: *Surrey Stormwater Drainage Regulation and Charges Bylaw* No. 16610 (2008)
Topic: Language in the bylaw that gives power to the neighbourhood plans and ISMPs to regulate rainwater and source controls
Page #: 8-9
Text: PART 5 - ON-SITE STORMWATER MANAGEMENT REQUIREMENTS

9. Newly created parcels shall be constructed with on-site stormwater management facilities when these are prescribed through Council approved neighbourhood plans, master drainage plans, integrated stormwater management plans or as required in a Servicing Agreement or specific service connection.

10. The owner of real property where an on-site stormwater management facility has been installed must ensure that the facility is accessible and is maintained in good condition and functioning as designed at all times.

11. For properties with commercial and industrial uses as detailed in Section 51, proof of maintenance or operation reports for on-site stormwater management facilities shall be submitted to the City for approval prior to the renewal or issuance of a business license.

Cowichan Valley Regional District

Document: *South Cowichan OCP*
Topic: Development Permit Area rainwater management requirements
Page #: 170
Text: The Landscaping/Rainwater Management/Environmental Protection Guidelines apply to the subdivision of land, and to commercial, industrial, multiple family and intensive residential development and their accessory uses.

1. Preparation of a landscaping plan by a British Columbia Society of Landscape Architects (BCSLA) or BC Landscape and Nursery Association (BCNTA)-certified landscape architect is preferred. Any landscaping plan submitted with an application for a development permit, whether professionally prepared or not, will be assessed by the CVRD according to BCSLA/BCNTA guidelines.

2. All required landscaping plans should be integrated with a rainwater management plan, which should favour natural solutions to drainage such as rain gardens and bio-swales, and should contain measures to limit impervious surfaces. The rainwater management plan must be prepared by a professional engineer with experience in drainage and submitted with the application for any commercial, mixed use or multiple family residential development proposal.

3. Runoff from the development must be strictly limited to prevent rainwater flows from damaging roads, surrounding properties and sensitive watershed features. Pervious surfaces should predominate, to encourage infiltration of water. The removal of trees should only be allowed where necessary and where alternate vegetation and water retention measures can be achieved.

4. For subdivision, where appropriate, lands should remain in a natural state, with landscaping measures used to provide rainwater infiltration.

Document: *South Cowichan Zoning Bylaw*
Topic: Impervious surface definition
Page #: 12
Text: "Impervious surface coverage" means a non-natural surface, including the roof of a building or structure, that does not allow precipitation to penetrate through to the natural ground underlying the artificial surface;

Document: *South Cowichan Zoning Bylaw*
Topic: Impervious surface limit example for village suburban residential zoning
Page #: 67
Text: Impervious surface coverage of a parcel in the R-2 Zone shall not exceed 35%, of which not more than 30% may be parcel coverage.

Document: *Subdivision Bylaw*
Topic: Subdivision approval process
Page #: 3-4
Text: Application for Subdivision Approval

a) Applications for subdivision shall be submitted to the appropriate District Office of the Provincial Ministry of Transportation and Highways;
b) The Ministry of Transportation and Highways shall forward one copy of the proposed subdivision together with all supporting documentation to the Regional District
c) The Regional District shall advice the Ministry of Transportation and Highways, in writing, as to any requirements for the subdivision.

Document: *Subdivision Bylaw*
Topic: Drainage services
Page #: 7
Text: Services - Drainage

In determining whether the design of any drainage collection system for a proposed subdivision is adequate to provide satisfactory drainage, the Approving Officer may require:

a) an engineering study (sealed by a professional engineer) to determine:

1. the drainage characteristics of the site;
2. the drainage characteristics upsteam and downstream from the site;
3. design options including on-site retention/storage;overland flow; channel capacity and volume/storage; and storage retention and routing;
4. impact of eventual discharge of the water from the subdivision;
5. the channel capacity of the system given the volume and storage capacity.