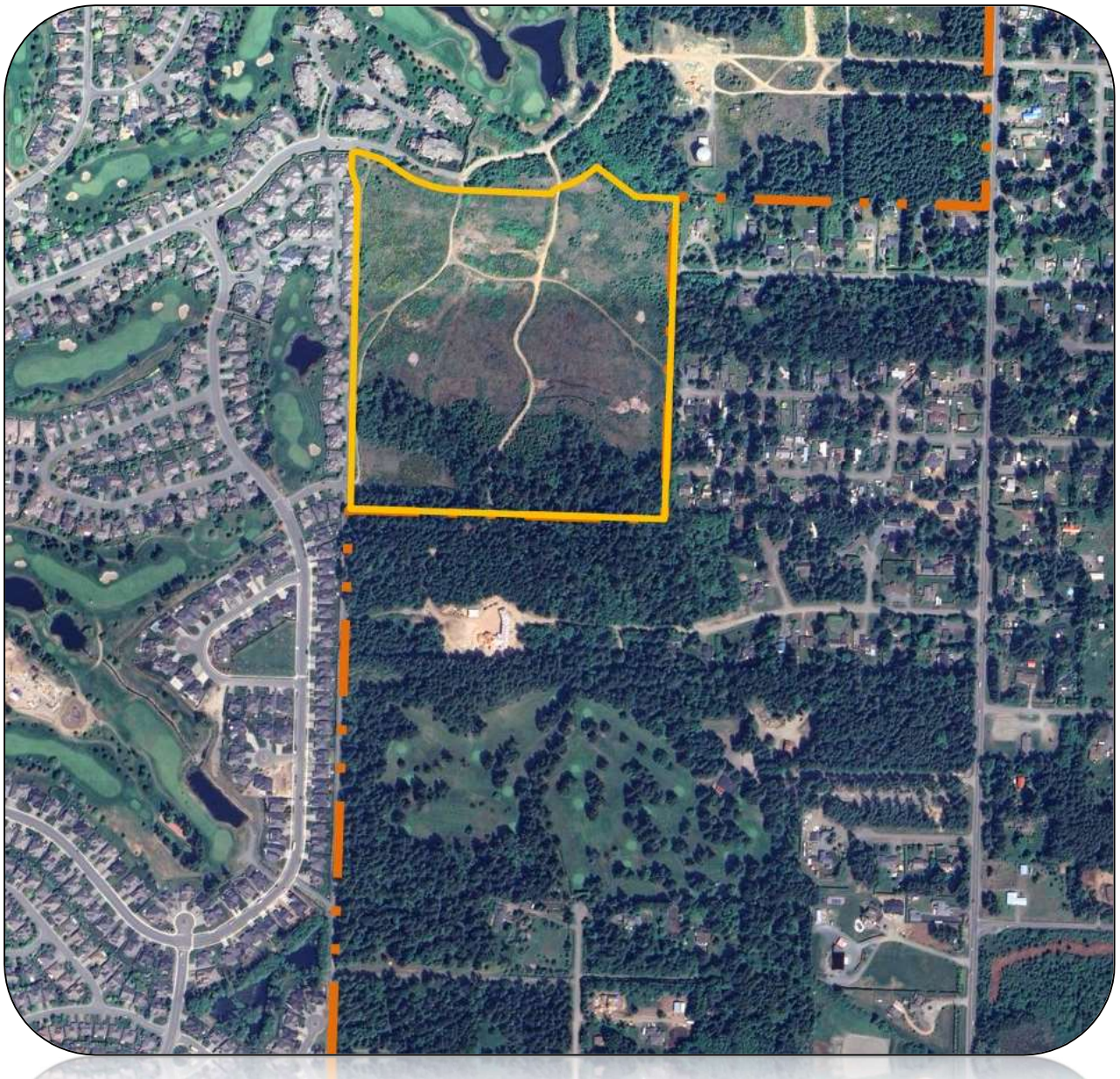
Crown Isle
RESORT & GOLF COMMUNITY

Lannan Road Development (the site)
For Zoning Amendment Bylaw No. 2973
-
Preliminary Stormwater Management Master Plan (PSMMP)



2023 Airphoto from Google Maps

May 22, 2025

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Revision 2

Parksville, BC

Date	Revision No.	Description
March 6, 2024	-	80% Draft Report
March 11, 2024	-	For Review
March 14, 2024	-	Final Report
January 22, 2025	1	Updated Report
May 22, 2025	2	Updated Report

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May 22, 2025
9109-181-09

City of Courtenay
Development Services
830 Cliff Avenue
Courtenay, BC, V9N 2J7

Attention: **Marianne Wade**
Director of Development Services

Dear Sirs:

Re: Lannan Road Development (the site) for Zoning Amendment Bylaw No. 2973
Preliminary Stormwater Management Master Plan (PSMMP), Revision 2

A pdf copy of our updated report entitled "**Lannan Road Development (the site) for Zoning Amendment Bylaw No. 2973, Preliminary Stormwater Management Master Plan (PSMMP), Revision 2**" dated May 22, 2025 is attached for your reference. This document is an updated version of the January 22, 2025 PSMMP, which was revised to address the City's March 14, 2025 review comments. A copy of that review memo is included in Appendix E of this report.

Subsequent to receiving the City's comments we met with staff to review each item and discuss a mutually acceptable resolution. Outlined below is a summary of how each item was resolved. Most of the clarification items are addressed within this cover letter. Where edits to the previous report were required, they are referred to in **bold text** (three items), with the corresponding page reference noted. For ease of comparison, we have kept the same numbering system referenced in the City's March 14th, 2025 review letter.

Item 19) Summary tables listing the volumes and peak flow release rates required by each approval jurisdiction has been prepared and are included as **Appendix F.**

A new sentence has been included on page 5 at the end of the first paragraph in Section 3 Design Standards**. "See Appendix F for summary tables of volumes and peak flows for each storage facility and how they address the requirements of each regulatory jurisdiction."**

Item 20) The design for the proposed infrastructure works that will be located outside of the City of Courtenay can be circulated to the applicable approval agency during the detailed design process for review and comment.

Item 21i) The design intent will be to set the floor elevations of the adjacent dwellings and select pipe sizes and grades so that the estimated HGL in a pipe during a 10-year storm does not rise above the adjacent finished floor elevation, in accordance with Bylaw 2919 design standards.

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City of Courtenay
Ms. Marianne Wade

Item 21ii) The applicant has agreed to register SRW's over the proposed storm drainage works that will be located on private property at 2205 Galleon Way and 1239 Anderton. *Note – a property with the address 2205 Parry Place does not exist.*

Item 22) All future storm water detention facilities that will be built on future multi-family sites will be owned and operated by a future strata corporation.

Item 22i) The existing storm pipe on *1131 Parry Place* that conveys drainage from Lake 20 is not hydraulically connected to any of the drainage works proposed for the Lannan site. None of the drainage from the lands within the Lannan catchment area will enter the pipe located on 1131 Parry Place. The request for an SRW over the Lake 20 outlet pipe is a separate issue and not part of this rezoning application.

Item 23) A1 - The catchments areas and the dividing line for the Little River / Brooklyn Creek tributary areas have been slightly altered between pre- and post-development conditions to reflect the anticipated future property lines.

A2 - See Appendix F for summary tables of volumes and peak flows for each storage facility and how they address the requirements of each regulatory jurisdiction.

Item 24) There is a barrier that prevents fish passage into the existing wetland. The proposed design will maintain the existing hydraulic separation and be designed in accordance with Federal and Provincial regulations.

Item 25) The proposed storm management works will be designed to meet the most stringent standard of the applicable approval jurisdiction. See the first sentence in Section 3 on page 5 of the PSMMP.

Item 26) See the response above for Item 25.

Item 27) The second to last paragraph in Section 3.2 on page 8 has been replaced with the following sentence.

"**The intent is that the proposed storm water works for the Lannan development will be designed to meet the objectives of the ACSS.**"

Item 28) Comment acknowledged.

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Item 29) The proposed infiltration facilities within the Brooklyn Creek catchment area are complementary to the proposed storm water conveyance and detention facilities. The proposed infiltration facilities are shown to address Town of Comox requirements only – they do not lessen or reduce the design requirements of the storm drainage works that will be designed to address City of Courtenay Bylaw 2929 requirements. Infiltration rates will be investigated during the detailed design stage.

Item 30) See the response above for Item 29. Whether the infiltration rates are fast or slow, they will not impact the design of the proposed storm drainage infrastructure for the Lannan development. The proposed storm drainage works will be designed on a stand-alone basis assuming that infiltration is not available.

Item 31) The comments regarding SRW widths for buried utilities and the setbacks from the top of the storage facilities are acknowledged. The proposed widths and setback limits will be established during the detailed design process using Bylaw 2919 criteria.

Item 32) Comment acknowledged.

Item 33) See the response above for items 29 and 30. The infiltration rate has been specified by the Town of Comox. It does not impact the size of the proposed storm drainage works, as the drainage works will be designed on the assumption that infiltration is not available.

Item 34) See the response above to items 29, 30, and 33. Each private onsite infiltration trench will have an overflow connection to the municipal storm drainage system. Lot grading plans will be developed during the detailed design phase. Maintenance documentation can be developed during the detailed design phase.

Item 35) An onsite detention facility will be required for each proposed multi-family site. The onsite facility for each multi-family site will be designed as part of the future development of those lots.

Item 36) See the response above for Item 27.

In the sections on pages 22, 26, 30, and 32 that refer to MoTT requirements, the sentences have been revised as follows:

“The intent is that the proposed system will be designed to meet MoTT’s requirement for…”

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City of Courtenay
Ms. Marianne Wade

Item 37) The required environmental permits will be coordinated during the development permit and detailed design stages.

Item 38) See the responses for items 29, 30, 33, and 34 above.

Item 39) See the responses to items 25 and 26 above.

Item 40) Repeated item. See the response for item 22i above.

Item 41) Repeated item. See the response for item 23 above.

Item 42) Comment acknowledged. Details on piping size, material, and configuration to be determined during the detailed design stages.

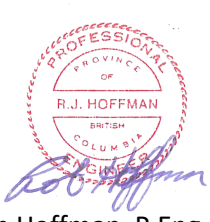
We trust that this updated document is suitable to support the re-zoning application for this development.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.

Richard Cave, AScT., LEED Green Assoc.
Project Technologist
Computer Modelling Specialist

Chris Holmes, P. Eng.
Senior Project Engineer



Rob Hoffman, P.Eng.
Principal
Permit to Practise Number 1001658

Crown Isle
RESORT & GOLF COMMUNITY

LANNAN ROAD DEVELOPMENT (THE SITE)

FOR ZONING AMENDMENT BYLAW No. 2973

-

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)

Table of Contents

TABLES

FIGURES

After Page

APPENDICIES

1 MASTER PLAN NEED & PURPOSE

Crown Isle proposes to develop a 16.8 hectare parcel of land located east of Royal Vista Way and Britannia Way and commonly referred to as the Lannan Road property.

The City of Courtenay staff report to council, dated November 22, 2023 (Zoning Amendment Bylaw No. 2973), included a number of conditions under the heading of Conditions Prior to Adoption, including the following:

- a Preliminary Stormwater Management Master Plan (PSMMP) is to be submitted and finalized, and
- The master plan is to combine the relevant information from the previous *Lannan Road Proposed Residential Subdivision Drainage Study, Rev 1,* dated September 1, 2022 and address any City comments that have been provided.

It is understood this master plan document will be included, as a schedule, in the Development Agreement.

The City's November 17, 2023 response included a compilation of comments documented about the project since February 2019. Many of the City's earlier comments were superseded by their more recent comments.

The City's June 21, 2024 response to the March 14, 2024 submission included several comments on the PSMMP. In January 2025 a revised PSMMP was submitted to the City, and additional review comments were provided by the City in their March 14th, 2025 review memo, which has been included in Appendix E. These comments have been addressed in this updated document. These comments have been addressed in this updated document.

This Master Plan document supersedes the previous documents by Koers & Associates Engineering Ltd., which include:

- Technical Memorandum No. 3 *Lannan Rd Development, Updated Conceptual Servicing Report to support Re-Zoning Application*, June 30, 2023
- *Lannan Road Proposed Residential Subdivision Drainage Study, Rev 1,* Sept 1, 2022
- Technical Memorandum No. 2, Rev. 1 *Lannan Rd Development Phase 1 – Subdivision for Britannia Development, Pre-Design Servicing Report*, Aug 10, 2021
- Technical Memorandum No. 1 *Lannan Rd Development Conceptual Servicing Report to support Rezoning Application*, May 9, 2019

Detailed information on the approach to other infrastructure services for this proposed development is provided in the accompanying updated report titled "Lannan Road Development (the site) for Zoning Amendment Bylaw No. 2973 *Preliminary Infrastructure Master Plan* (PIMP).

Although the property is within the City of Courtenay, it is located at the edge of the City's boundary and at a ridge of land that drains into areas where storm water is regulated by other approving agencies, specifically the Town of Comox and the Ministry of Transportation and Transit (MoTT). As such, the regulatory requirements of both of these agencies need to be addressed in the development of a stormwater management plan for this development.

The purpose of this master plan is to:

- Review the existing drainage conditions and patterns on this property,
- Estimate the impacts of development on the post development storm water runoff from the site,
- Evaluate the application of the design standards of the various approval agencies on the proposed stormwater management plan,
- Develop onsite design concepts that will mitigate post development stormwater runoff and address the differing design standards of the various downstream approving agencies.
- Outline the detailed design requirements for subdivision or development permit submissions.

2 THE PROPERTY

2.1 Location, Existing Use & Topography

The property is 16.8 ha in size and is located southeast of the current end of Royal Vista Way. The south and east property lines correspond with the boundary between the City of Courtenay and the Comox Valley Regional District (CVRD), Electoral Area B.

The property is bisected by a local land ridge that runs in a west – southeast direction and is the drainage divide between the Brooklyn Creek catchment and the Little River catchment.

- The majority of the site, 73% (12.2 ha), slopes gently in a southerly direction towards the south property boundary (and the City of Courtenay limits) and is part of the headwater catchment area of Brooklyn Creek. Outside of the City of Courtenay's boundaries, Brooklyn Creek traverses through the CVRD Electoral Area B (Lazo North) where drainage is under the jurisdiction of MoTT, before entering the municipality of the Town of Comox further downstream.
- The remainder of the property, 27% (4.6 ha) slopes gently in a north-easterly direction towards Lannan Road (and the City of Courtenay limits) and is part of the headwater catchment area of the south arm of Little River. At Lannan Road, runoff leaves the City of Courtenay and flows east into the drainage ditch on the south side of the road. This ditch is located within the CVRD Electoral Area B (Lazo North) where drainage is under the jurisdiction of MoTT.

Figure 1 shows the existing site topography and the ridge across the property.

2.2 Proposed Residential Subdivision

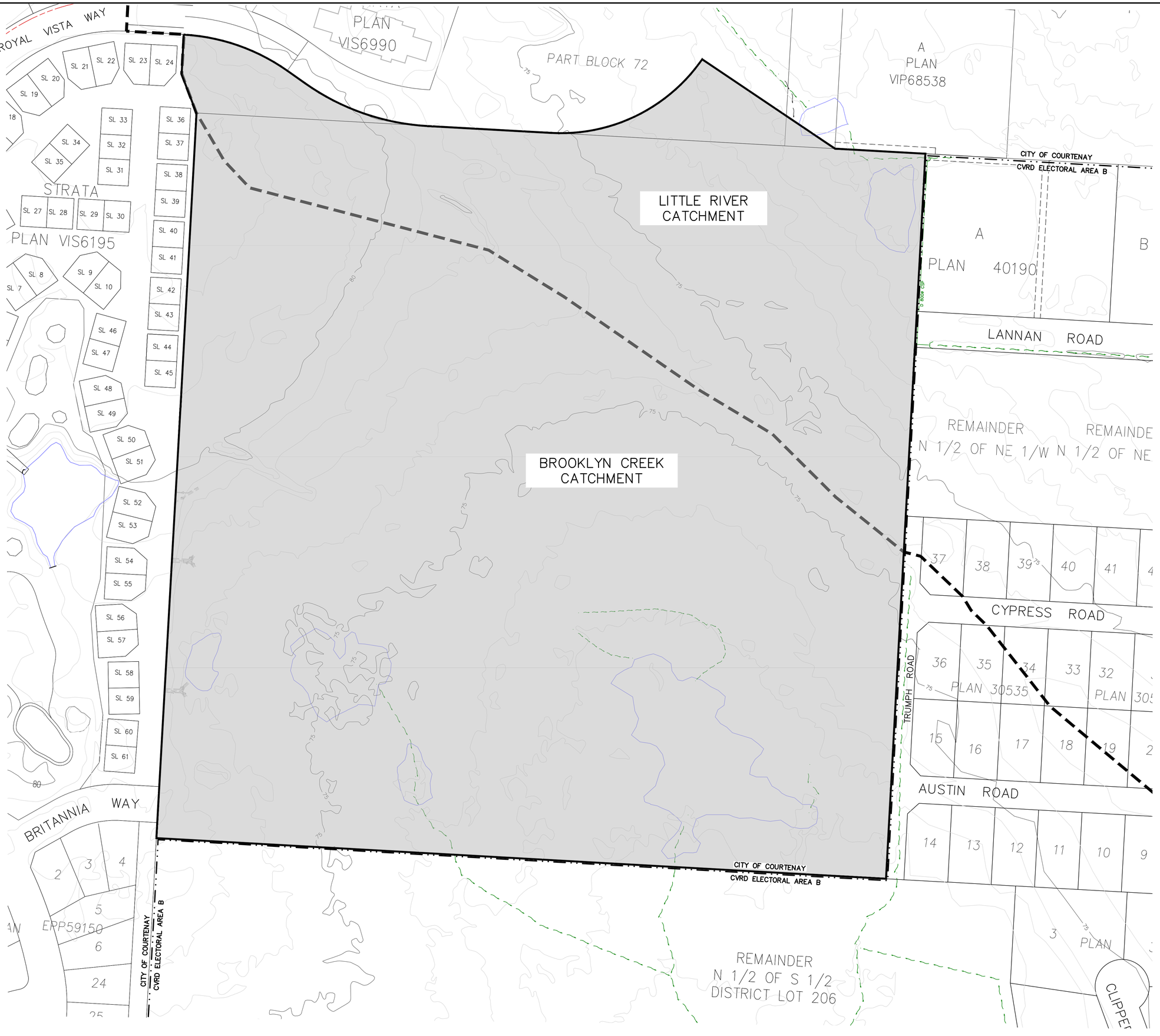
The proposed type and amount of development is summarized in **Table 1**.

Table 1 – Proposed Type & Amount of Development

Land-Use	Area Ha
Single Family Residential	4.5 (1)
Multi-Family Residential	6.2
Natural Areas	2.1
Parkland	3.0
Greenway	0.3
Stormwater Management	0.7
Residential Total	10.7
Parkland / Natural Areas Total	5.4
Stormwater Management Total	0.7
Development Total	16.8

Notes:

(1) Total area for Single Family Residential includes road allowances for the entire proposed development.



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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	21JAN25	RC	CH	JANUARY 2025 PSMMP

EXISTING CONTOURS
EXISTING DITCH/STREAM
EXISTING PIPE
WATERSHED CATCHMENT BOUNDARY
MUNICIPAL BOUNDARY
BOUNDARY OF PROPOSED DEVELOPMENT
EXISTING WETLAND

1:1000 0 20 60

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC
CHECKED	CH
APPROVED	RH
DATE	AUGUST 16, 2022
SCALE	1:1000

CLIENT

SILVERADO LAND CORPORATION

PROJECT

LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973

TITLE

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)

EXISTING CONDTIONS SITE PLAN

DRAWING No.	REV.	SHEET
FIGURE 1	1	1/1

File: 9109-181 Prelim2.dwg Plot Time: Jan 20, 2025 - 10:35am User: rcave

The site topography, along with the proposed development plan and the City's subdivision servicing specifications (one service connection per lot), results in a repositioning of the drainage divide across the property. **Figure 2** shows the proposed repositioned drainage divide along with the conceptual layout and associated storm drainage system. **Table 2** shows that the repositioning resulted in a minor change in the catchment areas post development.

Table 2 – Existing & Post Development Conditions
(for proposed development of Lot 1, DL 206, Plan VIP76495)

Description	Brooklyn Creek	Little River	Total
Catchment Area			
Existing	12.2 ha	4.6 ha	16.8 ha
Post Development	12.3 ha	4.5 ha	16.8 ha
Change	+0.1	-0.1	none
Land Use			
Existing [(1)]	Cleared 9.8 ha Forested 2.4 ha	Cleared 4.6 ha	Cleared 14.4 ha Forested 2.4 ha
Total	12.2 ha	4.6 ha	16.8 ha
Post Development	Single family 3.1 ha Multi-family 4.0 ha Natural Area 2.1 ha Park 3.0 ha Storm Water - Greenway 0.1 ha	Single family 1.4 ha Multi-family 2.2 ha Natural Area - Park - Storm Water 0.7 ha Greenway 0.2 ha	Single family 4.5 ha Multi-family 6.2 ha Natural Area 2.1 ha Park 3.0 ha Storm Water 0.7 ha Greenway 0.3 ha
Total Area	12.3 ha	4.5 ha	16.8 ha
Change [(2)]	+0.1	-0.1	none

Notes:

(1) Derived from 2022 Airphoto (City of Courtenay on-line maps).

(2) Changes = Post Development Total Area – Existing Total Area.

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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	21JAN25	RC	CH	JANUARY 2025 PSMMP
2	21MAY25	RC	CH	MAY 2025 PSMMP

STORM SEWER
DITCH (PROPOSED)
INFILTRATION BIO-SWALE
INFILTRATION TRENCH
CATCHMENT BOUNDARY
MUNICIPAL BOUNDARY
BOUNDARY OF PROPOSED DEVELOPMENT
EXISTING WETLAND
EXISTING WETLAND SETBACK
EXISTING STREAM/DITCH
EXISTING STREAM/DITCH SETBACK

1:1000 0 20 60

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC
CHECKED	CH
APPROVED	RH
DATE	MARCH 2024
SCALE	1:1000

CLIENT

SILVERADO LAND CORPORATION

PROJECT

LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973

TITLE

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)

PROPOSED DEVELOPMENT DRAINAGE SYSTEM

DRAWING No.	REV.	SHEET
FIGURE 2	2	1/1

3 DESIGN STANDARDS

This development discharges storm water into a drainage course on Lannan Road and into a drainage course on 2205 Galleon Way; both outside of the City of Courtenay boundaries. Since the City of Courtenay Standards differ from the standards set by the downstream approval authorities (MoTT and the Town of Comox), the design target for the storm drainage works for this development is compliance with the standards set by all three jurisdictions. The sections below outline the design standards for each. See Appendix F for summary tables of volumes and peak flows for each storage facility and how they address the requirements of each regulatory jurisdiction.

3.1 City of Courtenay

Since the proposed drainage infrastructure is located within the City of Courtenay boundaries, or within an SRW in favour of the City of Courtenay, the City's Subdivision and Development Servicing Bylaw No. 2919, April 16, 2018, applies to this development. The proposed drainage network, including the stormwater detention ponds, are to be designed in accordance with the Section 4.0 Stormwater Management of this bylaw.

3.1.1 Storm Drainage Collection System

The underground drainage system will be designed, as a minimum, for the 10 year storm event. If storm events larger than 10 years cause the hydraulic grade line (HGL) to conflict with the proposed building floor elevations, pipe sizes may be increased to lower the HGL. This would be reviewed and assessed during detailed design.

3.1.2 Stormwater Detention Pond

The detention ponds will be designed in accordance with the City's Bylaw No. 2919, which include:

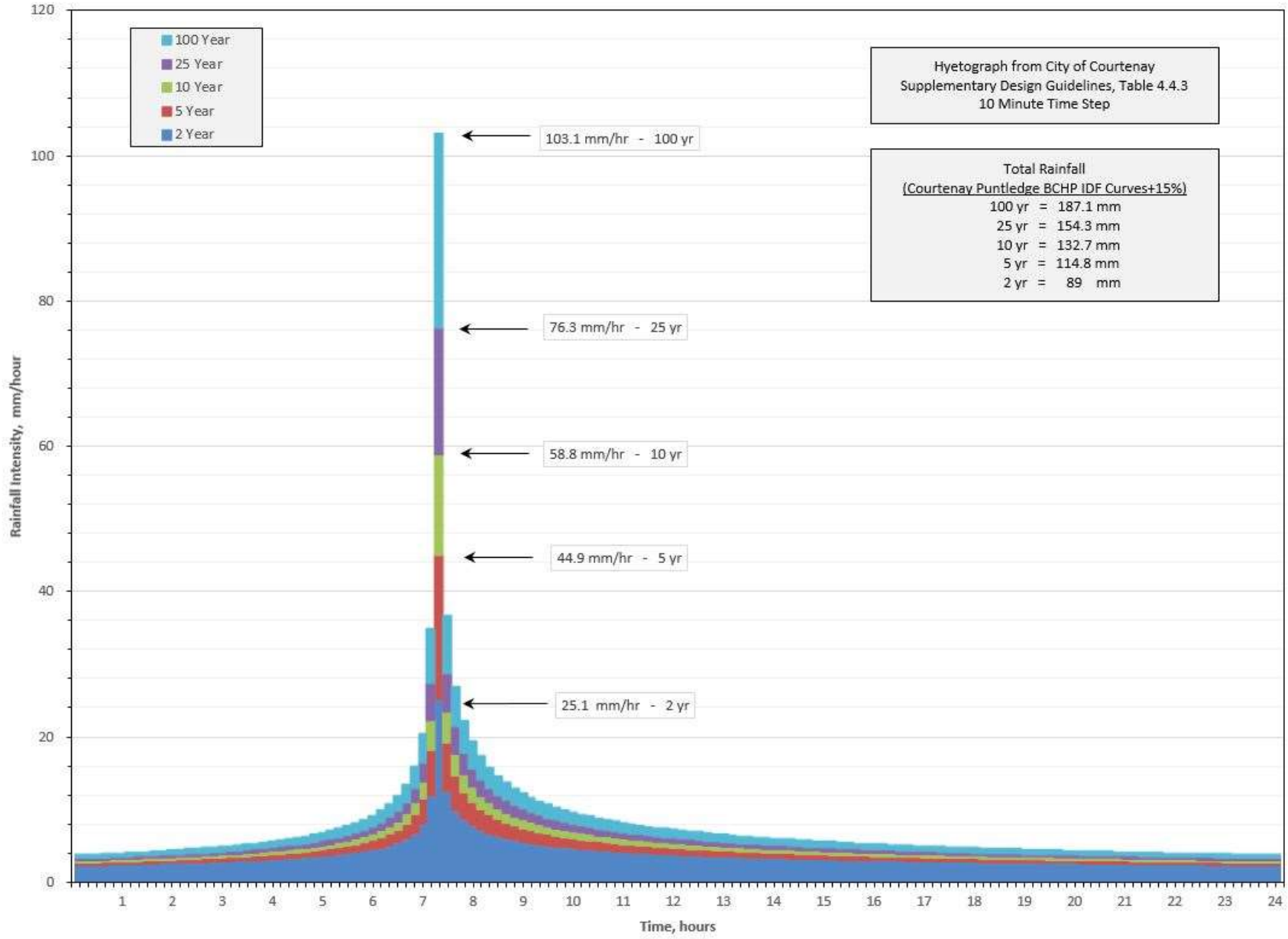
- **4.3.3 Stormwater Detention Release Rates**
  To be designed to limit post-development peak flows to be equal to the corresponding pre-development peak flows for the:
  - 1 in 2 year,
  - 1 in 5 year,
  - 1 in 10 year, and
  - 1 in 25 year return period storms.

- **4.11.3 & .4 Dry and Wet Detention Ponds**
  Depth and Freeboard:
  - 1 in 10 year event: 1.5 m maximum depth
  - 1 in 25 year event: 3.0 m maximum depth
  - Freeboard: 0.6 m

3.1.3 Design Rainfall Hyetograph

The City's Modified Chicago Distribution – 24 hour design storm in 10 minute increments with a 15% increase as shown in City's Table 4.4.3 of the Supplementary Design Guideline was used in the XPSWMM modelling of the on-site drainage network and stormwater detention ponds. A graphical presentation of the City's Table 4.4.3 data is presented in **Figure 3**.

Figure 3
City of Courtenay Design Hyetograph



3.2 Town of Comox, Brooklyn Creek Catchment

A portion of the site is within the headwaters of Brooklyn Creek which passes through the Comox Valley Regional District Electoral Area B (Lazo North) and then drains into the Town of Comox. The Anderton Corridor Servicing Study – Volume 1, Stormwater Management Plan, May 9, 2023 update (ACSS) was prepared by others for the Town of Comox to assist with the planning of stormwater management systems within the Brooklyn Creek catchment. The Anderton Corridor has been identified as an area that will be annexed into the Town of Comox as demand for development land occurs. Since a portion of the development is within the Brooklyn Creek catchment area, the City of Courtenay has directed the developer to apply the standards contained in the ACSS document.

We understand that the ACSS uses the Water Balance approach to mitigate the increase in risk of downstream flooding and stream degradation of Brooklyn Creek resulting from future development. This study notes that:

> "this approach will not solve existing problems in the watershed and along the stream corridor however it will allow development to proceed without increasing the impacts which include the risk of downstream flooding and stream degradation." (ACCS, page 3).

The ACSS directs the use of concise runoff volume and rates of flow design targets when developing land within the Anderton Corridor. The targets include:

- infiltration areas (m^2/ha) and retention storage volumes (m^3/ha)
- base flows (L/s per ha)
- neighbourhood detention pond unit storage volumes (m^3/ha)
- unit peak discharge rates (L/s per ha)

As discussed with both the City of Courtenay and the Town of Comox during their April 5, 2022 meeting, the proposed storm water works for the Lannan development will be designed to meet the objectives of the ACSS.

Silverado Land Corporation has engaged with the Brooklyn Creek Watershed Society (BCWS) regarding the conceptual drainage system for the Lannan Development. Written endorsement from the BCWS is included in **Appendix C**.

3.2.1 Runoff Volume Reduction & Base Flow Design Targets

The ACSS proposes the construction of volume reduction systems to capture and store surface runoff while allowing the captured volume to infiltrate deeper into the ground. These design unit targets are summarized in **Table 3**.

Table 3 – Runoff Volume Reduction Target Unit Values

Description	Design Unit [2]	Amount of Imperviousness [1]	
		60 %	90 %
Infiltration Area	m^2/ha	200	400
Infiltration Volume	m^3/ha [3]	60	120
Base Flow	L/s per ha [4]	1	1
Detention Volume	m^3/ha	475	475

Notes:

(1) The Table 3.2 – Land Use Imperviousness in the ACSS presents potential imperviousness values by land-use (as shown below) and notes that impervious values will be established at the time of rezoning and subdivision:

- Park 40 %
- Single Family Residential 60 %
- Multi Family 80 %
- Mixed Commercial 90 %
- School 60 %

(2) From ACSS Table 4.2 – Effect of Imperviousness which are based on an infiltration rate of 10 mm/hr at the end of 24 hours. Geotechnical input would be required to determine the actual infiltration rate of the receiving soils.

(3) For all areas of the development including road allowances and serviced lots.

(4) Defined as the average pre-development discharge rate.

3.2.2 Neighbourhood Detention Pond Design Targets

The ACSS proposes the development of neighbourhood detention ponds and presents a target unit storage volume of 475 m^3/ha and a 100 year (maximum) peak unit discharge flow of 16.1 L/s per ha for varying amounts of imperviousness. These design targets are meant to be used in conjunction with the Infiltration Volume targets listed in **Table 3**.

3.3 Ministry of Transportation & Transit

Stormwater runoff from the property flows into existing drainage courses that originate within the City of Courtenay and continue into Electoral Area B of the Comox Valley Regional District. Roads and drainage infrastructure in this area are operated and maintained by MoTT. Since these storm drainage courses are under the jurisdiction of MoTT, a review of the relevant MoTT storm drainage design standards is required.

The BC Ministry of Transportation and Infrastructure Supplement to TAC Geometric Design Guide, Section 10.10.03 Requirements for Drainage Designs, Land Development Drainage Design includes the following requirements:

- "All (land development) drainage systems must include run-off controls to limit post-development peak discharge rates to the pre-development rates for 5 year return periods."
- "an increase in downstream flooding or stream erosion will not be allowed. Designs will achieve this requirement unless it can be demonstrated that these changes do not adversely impact property or the environment."
- "un-attenuated flood waters in excess of the 5 year discharge that by-pass the detention facility must not adversely affect the receiving ditch or channel."
- "an unconfined emergency spillway capable of passing a 100 year peak discharge should be provided to direct overflow safely into the downstream watercourse."

With regard to Climate Change Adaption, the Design Guide notes:

- Designers will give "reasonable consideration of the impacts of climate change and weather extremes appropriate to the scale of the project (including, new, rehabilitation and maintenance projects)."

4 COMPUTER MODELLING

4.1 Computer Modelling Purpose

In accordance with the City of Courtenay's Stormwater Management requirements, computer modelling was used to carry out a Runoff Analysis for the preliminary design of the stormwater detention facilities to:

- limit post development peak flows to the corresponding pre-development peak flows for the 2 year, 5 year, 10 year, and 25 year return period storm events, and
- manage the release of flows for larger return period storm events, up to the 100 year return period.

4.2 XPSWMM Software Program

The computer program XPSWMM was used. The program is based in the U.S. Environmental Protection Agency's SWMM, as per the City's design guidelines section 4.4 Runoff Analysis.

4.3 Catchment Areas

The catchment and sub-catchment area boundaries were established using digital LIDAR mapping provided by the City of Courtenay and the Province of British Columbia along with aerial photography; limited topographic survey; and local knowledge.

For each catchment area, values for the following parameters that mathematically represent each sub-catchment area were entered into the computer model:

- average width,
- average slope,
- Manning's N,
- depression storage,
- Horton infiltration parameters (max & min infiltration rates and rate of decay), and
- Land-use (percent impervious).

The Horton infiltration method was used to model pervious and impervious surface areas separately in the drainage system model as directed by the City in previous storm water modelling assignments for the Crown Isle development.

The soils within the catchment areas were classified as Type B-C soils with moderate to low infiltration properties. **Table 4** lists the values of the above listed parameters (excluding percent imperviousness) entered in the model for the various land-uses.

Table 4 – Stormwater Modelling Horton Storage & Infiltration Parameters

Land Use	Pervious Areas							Impervious Areas	
	Depression Storage mm	Manning's N	Zero Detention %	Infiltration Rates				Depression Storage mm	Manning's N
				Soil Type	Max mm/hr	Min mm/hr	Decay 1/sec		
Urban	6	0.35	0	B-C	25	1.3	0.00115	1.6	0.015
Park	6	0.35	0	B-C	25	1.3	0.00115	1.6	0.015
Undeveloped	10	0.40	0	B-C	25	1.3	0.00115	1.6	0.015
Woodland	10	0.40	0	B-C	25	2.3	0.00115	1.6	0.015

5 BROOKLYN CREEK CATCHMENT

5.1 Collection & Conveyance System

The proposed drainage collection and conveyance system is shown in **Figure 2** and **Figure 4** and discussed below.

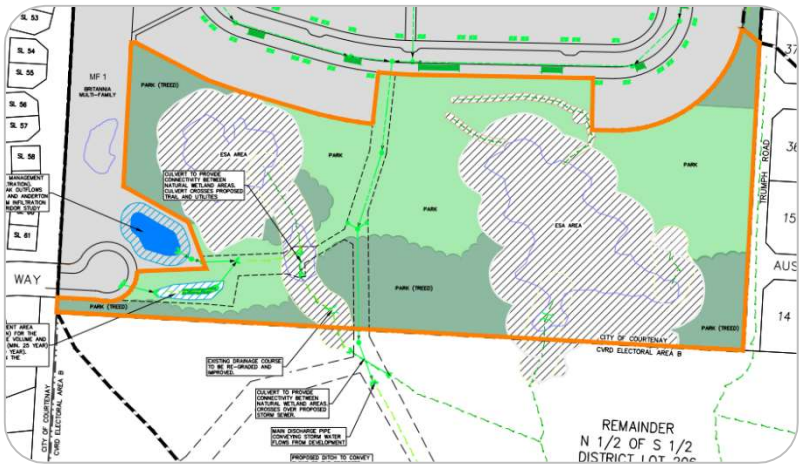
5.1.1 Developed Area Stormwater Management

Within the City of Courtenay, storm drain mains in the road allowances will convey stormwater from developed lands to a low point on the proposed extension of Lannan Road adjacent to the proposed park. From here, a storm drain main will convey the stormwater to the south, just beyond the City of Courtenay municipal boundary, and onto private property (2205 Galleon Way [Rem N ½ of S ½, DL 206]) located within the CVRD, Electoral Area B (Lazo North). The stormwater will be conveyed in an open channel south across the property before entering a pipe and into a detention pond to be constructed on "The Park at Crown Isle" golf course property (1239 Anderton Road [Lot C, Plan 27276]) located within the CVRD, Electoral Area B (Lazo North). The proposed pipes, open channel and pond within the Regional District lands will be within a City of Courtenay SRW.

The routing of stormwater runoff discharged from the pond is discussed under **5.7 Parry Place Storm Sewer**.

Open channels, when space is available, are preferable to piped systems in that they have considerably more capacity to convey extreme event flows and provide an ability for water to infiltrate into the ground for ground water recharge.

5.1.2 Undeveloped Areas and Parkland Stormwater Management



Parkland consisting of natural areas and treed and un-treed parks is proposed for the southern end and eastern side of the development (see **Figure 2**). There are two existing natural areas noted as "ESA-Environmentally Sensitive Area" and are shown in Figure 1 of the *Environmental Master Plan*, prepared by Corvidae Environmental Consulting Inc. These wet areas, along with most of the parkland drain via existing streams that flow southeast. These natural streams will remain, maintaining flow patterns from the natural areas. Culverts will be installed at trail, access and utility crossings as required to maintain this

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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	21JAN25	RC	CH	JANUARY 2025 PSMMP
2	21MAY25	RC	CH	MAY 2025 PSMMP

PROPOSED STORM SEWER
DITCH (PROPOSED)
DITCH (EXISTING)
POND CATCHMENT BOUNDARY
MUNICIPAL BOUNDARY
BOUNDARY OF PROPOSED DEVELOPMENT
WATERSHED CATCHMENT BOUNDARY

1:2000 0 40 120

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC
CHECKED	CH
APPROVED	RH
DATE	AUGUST 16, 2022
SCALE	1:2000

CLIENT

SILVERADO LAND CORPORATION

PROJECT

LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973

TITLE

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)
BROOKLYN CREEK
PROPOSED DETENTION POND CATCHMENT AREA

DRAWING No.	REV.	SHEET
FIGURE 4	2	1/1

connectivity. Treated stormwater from MF 1 and the Britannia Way cul-de-sac will flow into these streams. See section 5.5.1 and 5.5.4 for details.

5.2 Detention Pond Location

We understand that previous meetings and discussions between the City and Crown Isle have concluded that the detention pond can be located on "The Park at Crown Isle" golf course property (1239 Anderton Road) within the CVRD. We understand that the storm drainage works required that are beyond the City of Courtenay's municipal boundary are to be owned and maintained by the City of Courtenay, within an SRW.

A preliminary location and layout of the detention pond is presented in **Figure 4**. Input from the golf course operation, along with detailed topographic survey and environmental input, will be required to confirm the pond location, shape, and size during detailed design.

5.3 Detention Pond Preliminary Design

5.3.1 City of Courtenay Design Requirements

A preliminary design of the detention pond and its flow control structure has been developed per the City's design standards for the following return period storm events by applying the City's design hyetograph (**Figure 3**) to the pre and post development computer models:

- 1 in 2 year,
- 1 in 5 year,
- 1 in 10 year, and
- 1 in 25 year.

The preliminary design of the flow control outlet structure incorporates three orifice openings at different elevations to control the release of flows for the various return periods. The preliminary sizing and invert elevation of each orifice is listed in **Table 5**.

Table 5 – Detention Pond Flow Control Orifice Preliminary Sizing, Brooklyn Creek Catchment

Orifice No.	Shape	Dimensions			Area cm^2	Invert Elevation m	Water Depth (1) m
		Length mm	Height mm	Dia. mm			
1	Rectangle	500	100	-	500	65.50	0
2	Rectangle	750	200	-	1500	66.15	0.65
3	Circular	-	-	450	1,590	66.30	0.80

Notes:

(1) Based on a Normal Water Level Elevation = 65.50 m.

(2) Orifice sizes, invert elevations and water depths to be confirmed during detailed design.

The calculated post development peak flow leaving the pond is less than the calculated pre-development peak flows entering the pond for each of the City's design return period storm event as shown in **Table 6**.

Table 6 – Detention Pond Preliminary Peak Flows, Storage Volumes, & Water Depths, Brooklyn Creek Catchment

Return Period Year	Pre-Development Peak Flow (1) L/s	Detention Pond (Post Development) Peak Flow (1) In L/s	Peak Flow (1) Out L/s	Storage Volume m^3	Water Depth (2) m	Preliminary Elevation (2) m
2	73	138	68	1,320	0.4	65.9
5	115	256	109	2,660	0.7	66.2
10	143	346	137	3,030	0.8	66.3
25	223	465	197	3,460	0.9	66.4
100	347	652	294	3,990	1.0	66.5
Year	**L/s per ha (3)**	**L/s per ha (3)**	**L/s per ha (3)**	**m^3 per ha (4)**		
2	6.8	12.8	6.3	200		
5	10.7	23.7	10.1	400		
10	13.3	32.1	12.7	450		
25	20.7	43.1	18.3	520		
100	32.2	60.5	27.3	600		

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

(2) Based on a Normal Water Level Elevation = 65.50 m.

(3) Based on a total catchment area: 10.78 ha (includes areas outside of the proposed development).

(4) Based on the developed land catchment area: 6.69 ha.

(5) This pond was modelled with a capacity of 6,400 m3 at a depth of 1.5 m. Peak flows, storage volumes and water depths to be confirmed during detailed design.

5.3.2 Town of Comox, Anderton Corridor Design Requirements

For the neighbourhood detention pond, the calculated peak discharge and required storage volume based on an overall 60% imperviousness for the proposed 6.69 ha of development is presented in **Table 7**. The discharge rates and storage volumes requirements are in conjunction with, and

dependent on, the implementation of Runoff Volume Reduction infrastructure which is discussed in **5.4 Infiltration & Volume Reduction**.

Table 7 – ACSS Neighbourhood Pond Peak Discharges and Storage Volumes, Brooklyn Creek Catchment

Return Period Year	Target Unit Peak Discharge (1) L/s per ha	Target Unit Storage Volume (2) m^3 per ha
2	11.2	
5	14.0	
10	15.0	
25	15.9	
100	16.1	475
Year	**Peak Discharge (3) L/s**	**Storage Volume (4) m^3**
2	121	
5	151	
10	162	
25	171	
100	174	3,200

Notes:

(1) From ACSS Table 3.3 – Study Area Flood Frequency, Natural.

(2) From ACSS Table 4.2 – Watershed Targets for Mitigation.

(3) Based on a total catchment area of 10.78 ha.

(4) Based on a developed catchment area of 6.69 ha.

(5) The discharge and storage volume are in conjunction with and dependent on the implementation of Runoff Volume Reduction infrastructure that achieve the Runoff Volume Reduction Targets listed in **Table 7**.

It is noted that the calculated design storage volume and peak discharge for the Neighbourhood detention pond based on the ACSS requirements (**Table 7**) is notably lower than the City of Courtenay design requirements (**Table 6**) and reflects the different design approach and the use of different design rainfall and hydrologic data. The ACSS utilizes historical rainfall and regional streamflow data while the City of Courtenay uses a design hyetograph.

5.4 Infiltration & Volume Reduction

5.4.1 Town of Comox, Anderton Corridor Design Requirements

The calculated Infiltration area, Infiltration Volume and Detention Volume design targets based on an overall 60% imperviousness for the proposed 7.77 ha (includes MF 1 and Britannia Way cul-de-sac) of development are presented in **Table 8.**

Table 8 – ACSS Runoff Volume Reduction Preliminary Design, Brooklyn Creek Catchment

Description	Unit Rate (1)	Developed Area	Target Design Amount
Infiltration Area	200 m^2/ha	7.77 ha	1,554 m^2
Infiltration Volume	60 m^3/ha	7.77 ha	466 m^3
Base Flow	1 L/s per ha	7.77 ha	7.8 L/s
Detention Volume	475 L/s per ha	7.77 ha	3,700 m^3

Notes:

(1) From ACSS Table 4.2 for 60% impervious and which are based on an infiltration rate of 10 mm/hr at the end of 24 hours.

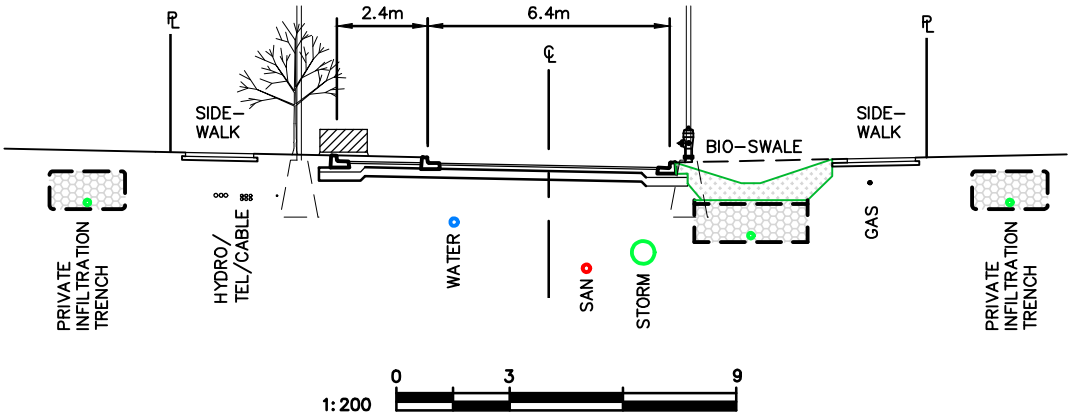
Infiltration area and volume reduction systems, in the form of bio-swales, rain gardens, and infiltration trenches, are intended to detain stormwater runoff within the developed areas and allow time for the flow to infiltrate into the ground.

On private property, infiltration and volume reduction systems could include, but are not limited to: minimum thickness (typically 300 mm) of absorbent topsoil, surface discharge of roof gutter leaders and/or roof leaders discharging to an infiltration trench/rock pit, pervious driveway surfaces and hydraulically disconnected driveway surfaces.

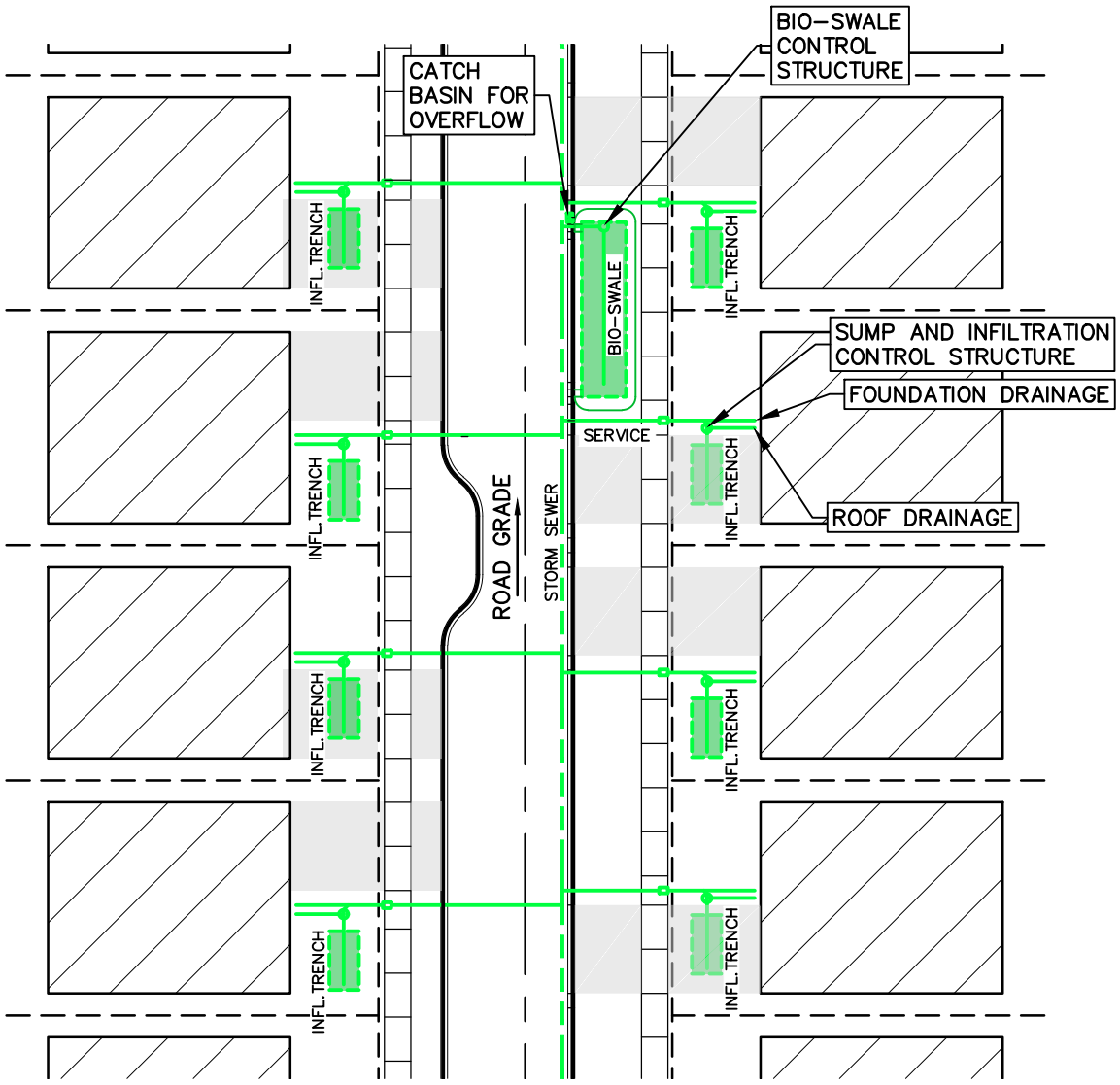
Within public road allowances, infiltration and volume reduction systems include boulevard rain gardens/bio-swales with retention volume and infiltration capacity. Within private single family and multi-family developments, infiltration trenches, rain gardens/bio-swales or infiltration areas within underground detention systems could be used.

Figure 2 shows the approximate locations of the bio-swale/rain gardens and the infiltration trenches. It is important to note that the locations and sizes of these facilities shown on **Figure 2** are conceptual and will change during detailed design when more information is available and when other third party utilities have been designed.

Figure 5 presents a typical local road cross section and plan view showing how infiltration and volume reduction systems might be implemented on private property and within the public road allowance.



TYPICAL SECTION – LOCAL ROAD ALTERNATIVE (CCSD L3)



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CLIENT	SILVERADO LAND CORPORATION
PROJECT	LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973
TITLE	PRELIMINARY STORMWATER MANAGMENT MASTER PLAN (PSMMP) CONCEPTUAL RUNOFF, INFILTRATION & VOLUME REDUCTION SYSTEMS
APPROVED	RH
DATE	JANUARY 2025
JOB No.	9109-181
SCALE	AS SHOWN
DWG No.	FIGURE 5

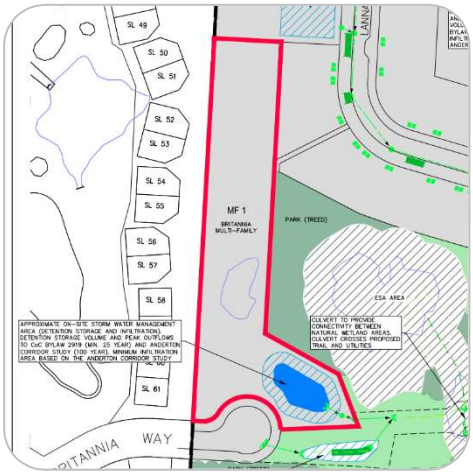
5.5 Multi-Family Development Sites and Britannia Way Cul-de-sac

There are three proposed multi-family development sites (MF 1, MF 2, and MF 3) within the proposed development that are located within the Brooklyn Creek catchment. Their locations are shown in **Figure 2** and **Figure 4**. Each site will be responsible for constructing storm water management facilities to meet the regulatory requirements of the City of Courtenay Bylaw 2919. In addition, the sites will need to meet the ACSS requirements. Some sites will require a higher level of detention storage under Bylaw 2919 compared to ACSS requirements as discussed below. Stormwater from the Britannia Way cul-de-sac must also be treated with detention and infiltration facilities.

The data presented for each proposed detention and infiltration facility are preliminary, based on an assumed percent impervious area and storage / controls configurations. Actual storage volumes and peak flows are to be confirmed during detailed design when more data is available.

5.5.1 MF 1 Britannia Multi-Family Site

This 0.83 ha site (see **Figure 2**) will be developed in the first phase and will initially not have the benefit of discharging into the large downstream detention pond. Consequently, the storm water management controls for this site will need to meet not only the City of Courtenay standards, but also the ACSS standards to the 100 year return period. An area in the southeast corner has been set aside for a wet/dry detention pond and infiltration area.



City of Courtenay Standard

Table 9 shows the estimated pre and post development peak flow leaving the site and the estimated storage volumes required.

Table 9 – MF 1 Preliminary Peak Flows and Storage Volumes

Return Period Year	Pre-Development Peak Flow (1) L/s	Detention Post Development Peak Flow (1) In L/s	Detention Post Development Peak Flow (1) Out L/s	Storage Volume m^3
2	11	28	8	181
5	19	53	10	289
10	25	71	11	366
25	41	97	15	433
100	66	139	32	487

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

ACSS Standard

Using the ACSS unit storage requirements listed in **Table 7**, the 0.83 ha site requires a 100 year storage volume of 394 m^3 with a corresponding target peak flow of 13.4 L/s. When applying City criteria for the 100 year event, the calculated storage volume of 487 m^3 (shown in **Table 9**) exceeds the ACSS requirements.

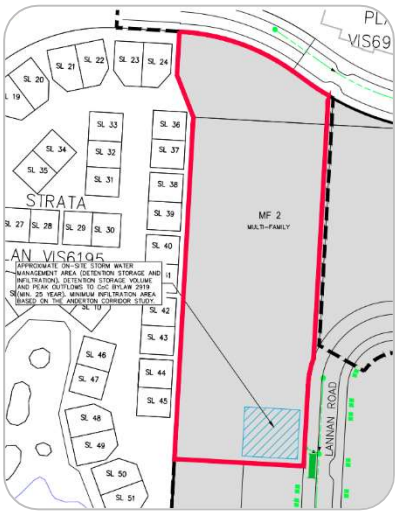
Applying the ACSS requirements in **Table 8**, the 0.83 ha site requires: an infiltration area of 166 m^2; an infiltration volume of 50 m^3; and a base flow of 0.8 L/s.

Post-development peak flows, storage volumes, and detention controls are approximate and to be confirmed during detailed design.

5.5.2 MF 2 Proposed Multi-Family Site, Royal Vista Way

This 1.41 ha site (see **Figure 2**) will have the benefit of the large downstream detention pond. Storm water management controls for this site will need to meet the City of Courtenay standards for detention storage volumes. The site will also need to meet the ACSS standards for infiltration volume, area and base flow (not detention volume).

It is assumed that the area in the southeast corner of the site will be used for detention facility. However, the development of the site may lend itself to multiple storage locations and infiltration areas.



City of Courtenay Standard

Table 10 shows the estimated pre and post development peak flow leaving the site and the estimated storage volumes required.

Table 10 – MF 2 Preliminary Peak Flows and Storage Volumes

Return Period	Pre-Development Peak Flow (1)	Detention Post Development		
		Peak Flow (1)		Storage Volume
Year	L/s	In L/s	Out L/s	m^3
2	16	54	15	300
5	28	101	21	460
10	36	135	34	510
25	58	184	48	570
100	93	262	90	610

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

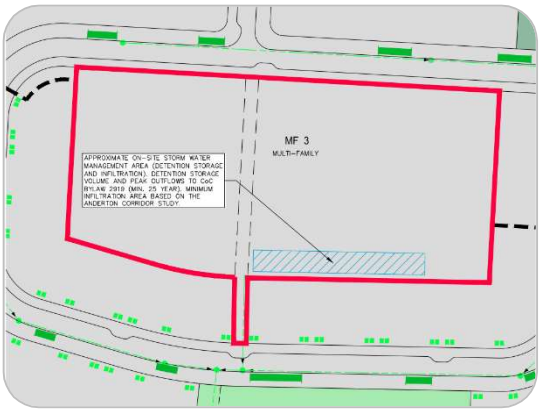
ACSS Standard

Applying the ACSS requirements in **Table 8**, the 1.41 ha site requires: an infiltration area of 242 m^2; an infiltration volume of 84 m^3; and a base flow of 1.4 L/s.

Post-development peak flows, storage volumes and detention controls are approximate and to be confirmed during detailed design.

5.5.3 MF 3 Proposed Multi-Family Site on Lannan Road

This 1.78 ha site (see **Figure 2**) will have the benefit of the large downstream detention pond. Storm water management controls for this site will need to meet the City of Courtenay standards for detention storage volumes. The site will also need to meet the ACSS standards for infiltration volume, area and base flow (not detention volume).



An area in the southeast corner is the likely location for a detention / infiltration facility. However, the development of the site may lend itself to multiple storage locations and infiltration areas.

City of Courtenay Standard

Table 11 shows the estimated pre and post development peak flows leaving the site and the estimated storage volumes required.

Table 11 – MF 3 Preliminary Peak Flows and Storage Volumes

Return Period Year	Pre-Development Peak Flow (1) L/s	Detention Post Development Peak Flow (1) In L/s	Detention Post Development Peak Flow (1) Out L/s	Detention Post Development Storage Volume m^3
2	21	68	20	360
5	36	127	26	560
10	47	171	38	660
25	75	232	58	740
100	121	331	106	790

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

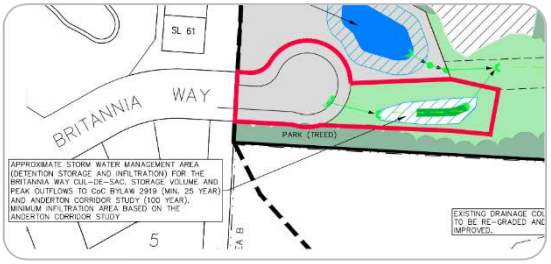
ACSS Standard

Applying the ACSS requirements in **Table 8**, the 1.78 ha site requires: an infiltration area of 356 m^2; an infiltration volume of 106 m^3; and a base flow of 1.8 L/s.

Post-development peak flows, storage volumes and detention controls are approximate and to be confirmed during detailed design.

5.5.4 Britannia Way Cul-de-sac

Britannia Way will be extended and a new cul-de-sac constructed in the first phase of development, prior to the construction of the large detention pond, so stormwater from this area must be treated to meet the City standards and ACSS standards for volumes and infiltration.



This 0.25 ha site (see **Figure 2**) includes the cul-de-sac, trail and detention pond area.

City of Courtenay Standard

Table 12 shows the estimated pre and post development peak flow leaving the site and the estimated storage volumes required.

Table 12 – Britannia Way Cul-de-sac Preliminary Peak Flows and Storage Volumes

Return Period Year	Pre-Development Peak Flow (1) L/s	Detention Post Development Peak Flow (1) In L/s	Detention Post Development Peak Flow (1) Out L/s	Storage Volume m^3
2	3	7	2.0	45
5	6	14	2.5	85
10	8	19	3.3	100
25	13	26	4.4	125
100	20	37	10.0	135

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

ACSS Standard

Using the ACSS unit storage requirements listed in **Table 7**, the 0.25 ha site requires a 100 year storage volume of 119 m^3 with a corresponding target peak flow of 4.0 L/s. When applying City criteria for the 100 year event, the calculated storage volume of 135 m^3 (shown in **Table 12**) exceeds the ACSS requirements.

Applying the ACSS requirements in **Table 8**,the 0.25 ha site requires: an infiltration area of 50 m^2; an infiltration volume of 15 m^3; and a base flow of 0.3 L/s.

Post-development peak flows, storage volumes, and detention controls are approximate and to be confirmed during detailed design.

5.6 Ministry of Transportation & Transit Requirements

The preliminary design of the detention pond and its flow control structure indicate post development peak flows can be reduced to pre-development peak flow rates for each of the design return periods (2 year, 5 year, 10 year, 25 year, 50 year, and 100 year) for the City's design hyetograph. The intent is that the proposed system will be designed to meet MoTT's requirements for:

- run-off controls to limit post-development peak discharge rates to the pre-development rates for 5 year return periods.
- not increasing downstream flooding or stream erosion.
- not adversely affecting the receiving ditch or channel where un-attenuated flood waters in excess of the 5 year discharge by-pass the detention facility.

Providing the detention pond with an emergency spillway would meet MoTT's recommendation for:

- an unconfined emergency spillway capable of passing a 100-year peak discharge to direct overflow safely into the downstream watercourse.

The City's design hyetograph inclusion of a 15% allowance for potential climate change would appear to meet MoTT's requirement to:

- give reasonable consideration of the impacts of climate change and weather extremes appropriate to the scale of the project (including, new, rehabilitation, and maintenance projects).

5.7 Parry Place Storm Sewer

As shown in **Figure 6**, the detention pond will discharge into an existing ditch that conveys flows south to Parry Place. This ditch joins with the existing roadside ditch on the west side of Parry Place, conveying the flows south to an existing 800 mm CSP culvert that discharges into Brooklyn Creek.

We understand that as a result of discussions and agreements between Silverado Land Corporation, The City of Courtenay, and MoTT, the flows released from the detention pond are to be conveyed within the Parry Place road allowance in an enclosed storm sewer that is to be owned and maintained by the City of Courtenay. A permit issued by MoTT to the City of Courtenay will be required for this storm sewer to be constructed.

The catchment area of this storm sewer is 26.7 ha, including the proposed development within the City and the existing catchment area within the CVRD Electoral Area B (Lazo North) is as shown in **Figure 6**. As the storm sewer will be owned and operated by the City of Courtenay, Bylaw No. 2919 will be the governing design guidelines. Section 4.3.1 of the Bylaw indicates that pipes are to be sized for Minor System (10 year return period). This standard is based on the availability of an overland flow path for larger storm events. At Parry Place, the addition of the storm sewer will

divert all of the existing flows north of Parry Place into this new piped system, leaving the existing roadside ditching with capacity to convey major system flows if needed.

The estimated peak flows for the proposed Parry Place storm sewer are shown in **Table 13**.

Table 13 – Estimate Peak Flows, Parry Place Storm Sewer

Return Period	Peak Flows (1) (2) L/s	Pipe Size (mm)	Pipe Slope (%)	Pipe Capacity (3) (L/s)	% Full (4)
10	352	750	0.5	839	42 %
100	860	750	0.5	839	103 %

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

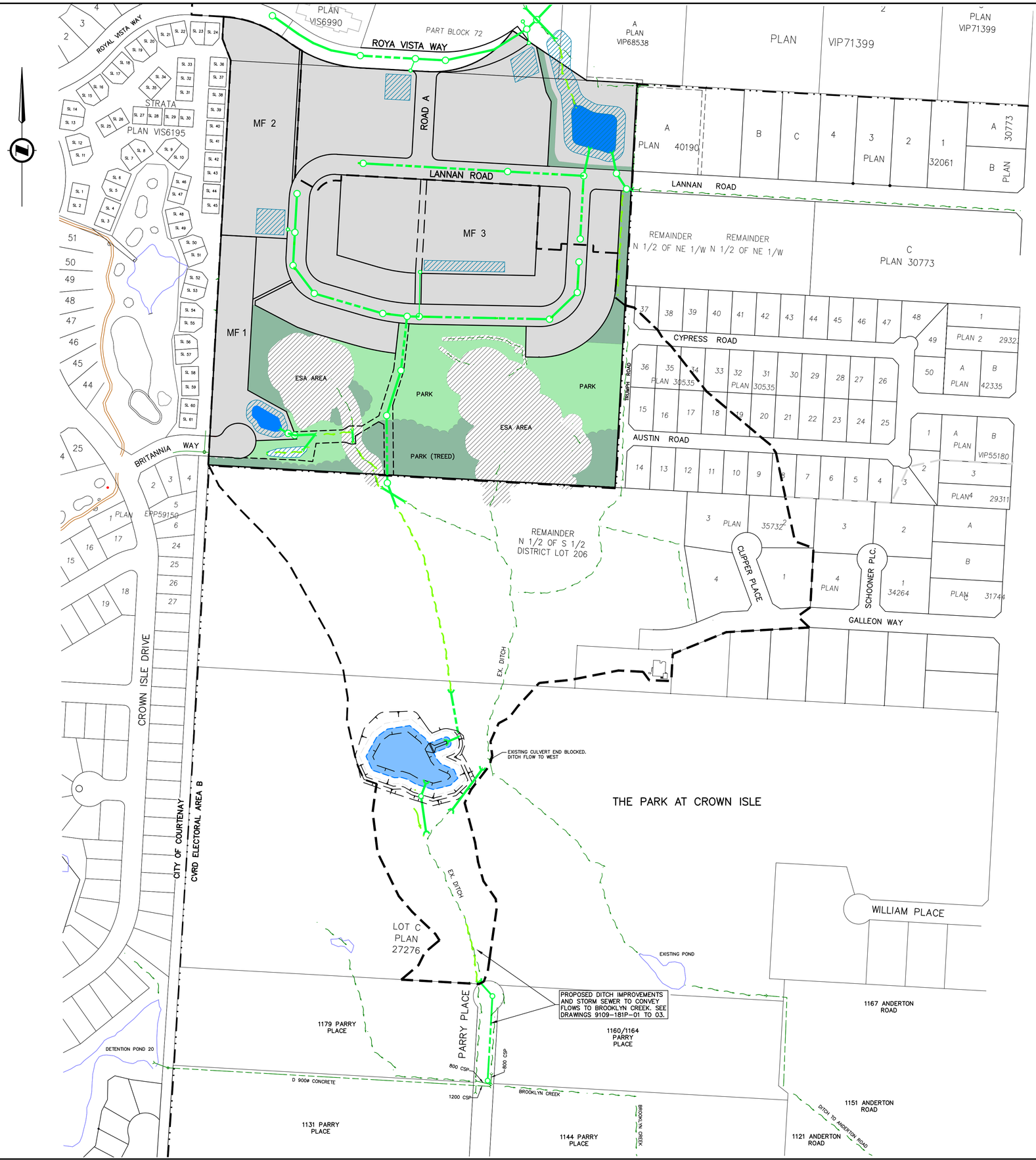
(2) Based on a 26.7 ha catchment, and per hectare flows from **Table 6** of 13.2 L/s/ha for the 10 year return period and 32.2 L/s/ha for the 100 year return period.

(3) The pipe capacity using Manning's equation, with a coefficient of roughness of 0.013.

(4) The HGL at the pipe outlet may influence the HGL at the upstream inlet. **Drawings 9109-181P-02** and **-03** show estimated HGL for the 10 and 100 year flows.

The proposed pipe will have the capacity to convey the 100 year peak flow. If, however, the pipe was to become blocked or if a storm in excess of the 100 year were to occur, the pipe would overflow into the existing drainage course on Parry Place. This drainage course includes two 800mm diameter CSP culverts, governing its flow capacity. These culverts have an estimated capacity of 1000 L/s, with a moderate 200mm headwater surcharge and 600mm of freeboard remaining. The flow could be contained within the Parry Place roadway ditch until it reaches Brooklyn Creek. Further topographic survey during the detailed design stage will confirm overland flow paths.

See **Appendix A** for the preliminary Parry Place Storm Sewer design **Drawings 9109-181P-01** to **-03**.



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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	21JAN25	RC	CH	JANUARY 2025 PSMMP
2	21MAY25	RC	CH	JANUARY 2025 PSMMP

PROPOSED STORM SEWER
DITCH (PROPOSED)
DITCH (EXISTING)
MUNICIPAL BOUNDARY
BOUNDARY OF PROPOSED DEVELOPMENT
PARRY PLACE CATCHMENT BOUNDARY

1:2000 0 40 120

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC
CHECKED	
APPROVED	
DATE	MARCH 2023
SCALE	1:2000

CLIENT

SILVERADO LAND CORPORATION

PROJECT

LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973

TITLE

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)

PARRY PLACE STORM SEWER CATCHMENT AREA

DRAWING No.	REV.	SHEET
FIGURE 6	2	1/1

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6 LITTLE RIVER CATCHMENT

6.1 Collection & Conveyance System

The proposed drainage collection and conveyance system is shown in **Figure 2** and **Figure 4**.

A network of pipes within the road allowances will collect stormwater and convey it to a proposed detention pond in the northeast corner of the proposed development. The pipes will collect drainage from the extension of Lannan Road and the proposed multi-family lots along the extension of Royal Vista Way. Each multi-family lot will be responsible for constructing storm water management facilities to meet the requirements of the City of Courtenay Bylaw No. 2919. This is discussed under **6.6 Multi-Family Development Sites**.

6.2 Detention Pond Location

The proposed drainage system will convey flows to a detention pond in the existing low lying area in the northeast corner of the proposed development which drains to the existing ditch on the south side of Lannan Road (see **Figure 2**).

A preliminary location and layout of the detention pond is presented in **Figure 4**. The final design and layout will be refined during detailed design. An existing isolated wetland area in this location is identified in the Environmental Master Plan. The dry detention pond design will include a "wet" pond area and it will be isolated from the existing ditch. As noted in the Environmental Master Plan, a Section 11 Application will be required to address the environmental requirements.

6.3 Detention Pond Preliminary Design

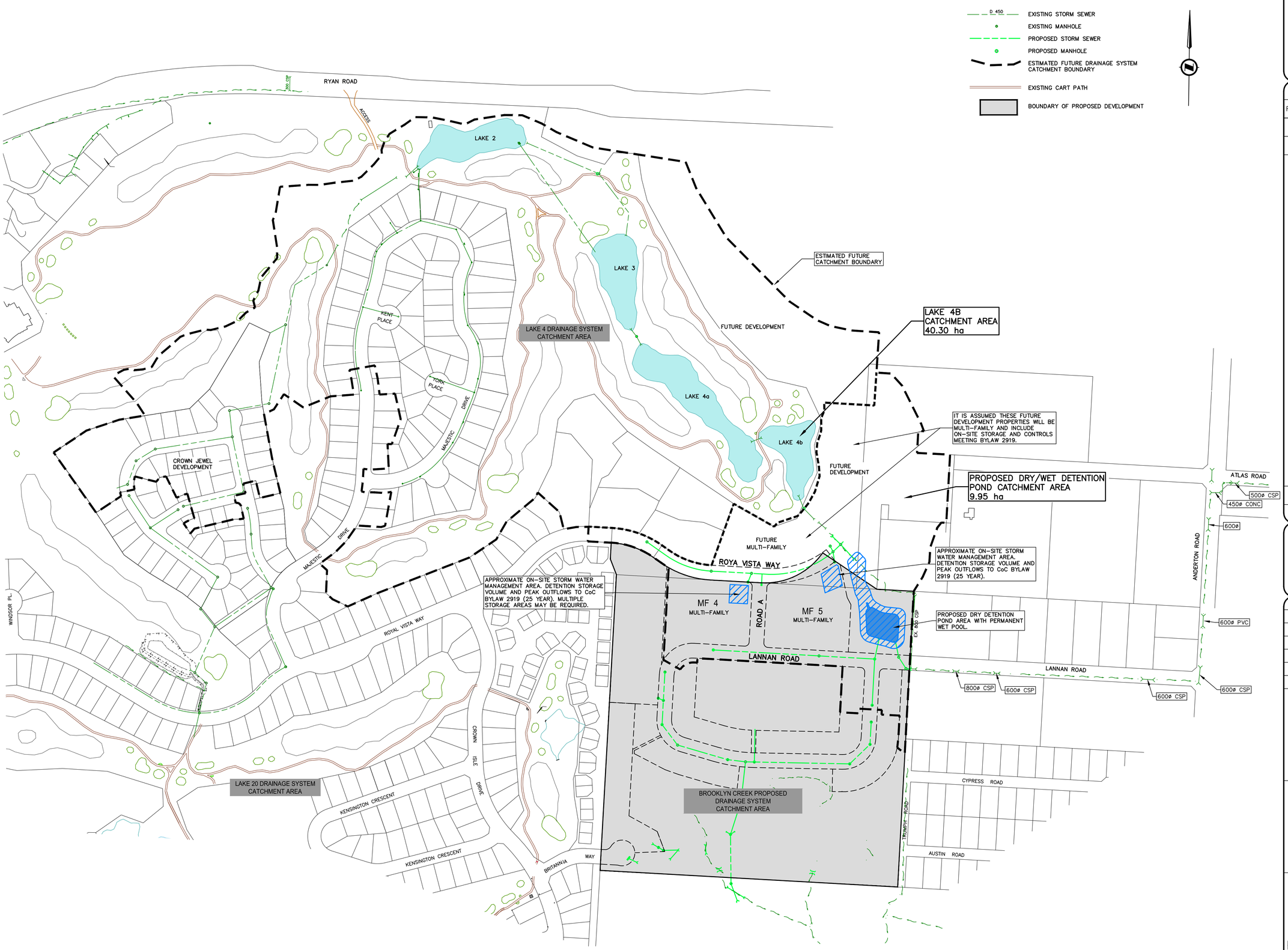
The detention pond would regulate stormwater runoff from the proposed development and lands yet to be developed to the east and south of Lake 4B that do not drain into Lake 4B, as well as receive managed flows from Lake 4B prior to discharge to the existing ditch on the south side of Lannan Road as shown in **Figure 7**.

The point of discharge of the pond is Lannan Road, is located within the CVRD and the existing ditch is under the jurisdiction of MoTT. The pond will need to be designed in accordance with the City of Courtenay design standards as well as comply with MoTT's stormwater management requirements. A brief discussion of each is presented below.

6.3.1 City of Courtenay Design Requirements

A preliminary design of the detention pond and its flow control structure has been developed per the City's design standards for the following return period storm events by applying the City's design hyetograph (**Figure 3**) to the pre and post development computer models:

1 in 2 year,	1 in 5 year,
1 in 10 year, and	1 in 25 year.



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REV	DATE	BY	ENG	DESCRIPTION
1	21JAN25	RC	CH	JANUARY 2025 PSMMP
2	21MAY25	RC	CH	MAY 2025 PSMMP

1:2500 0 50 150

ISS	DATE	BY	ENG	DESCRIPTION

RECORD OF ISSUE

SEAL

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC
CHECKED	CH
APPROVED	RH
DATE	MARCH 2024
SCALE	1:2500

CLIENT

SILVERADO LAND CORPORATION

PROJECT

LANNAN ROAD DEVELOPMENT (THE SITE) FOR ZONING AMENDMENT BYLAW No. 2973

TITLE

PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN (PSMMP)
LANNAN ROAD
PROPOSED DETENTION POND CATCHMENT AREA

DRAWING No.	REV.	SHEET
FIGURE 7	2	1/1

The detention pond will be a dry pond with a permanent wet pool area and function in concert with the upstream Lakes 2, 3, 4A & 4B stormwater management system.

The preliminary design of the flow control outlet structure incorporates three orifice openings at different elevations to control the release of flows for the various return periods. The preliminary sizing and invert elevation of each orifice is listed in **Table 14**.

Table 14 – Detention Pond Flow Control Orifice Preliminary Sizing, Little River Catchment

Orifice No.	Shape	Dimensions			Area cm^2	Invert Elevation m	Water Depth (1) m
		Length mm	Width mm	Dia. mm			
1	Rectangle	350	200	-	700	69.62	0
2	Rectangle	1000	110	-	1,100	70.60	0.85
3	Circular	-	-	600	2,830	71.75	2.00

Notes:

(1) Based on a pond invert elevation = 69.75 m

The calculated post development peak flow leaving the pond is less than the calculated pre-development peak flows entering the pond for each of the City's design return period storm event as shown in **Table 15**.

Table 15 – Detention Pond Preliminary Peak Flows, Storage Volumes, & Water Depths, Little River Catchment

Return Period Year	Existing Conditions, Peak Flow to Lannan Rd (1) (2) L/s	Detention Pond (Post Development)				
		Peak Flow (1)		Storage Volume m^3	Water Depth (3) m	Preliminary Elevation (3) m
		In L/s	Out L/s			
2	224	187	163	1,720	0.80	70.55
5	329	328	212	2,110	0.95	70.70
10	401	435	261	2,350	1.00	70.75
25	487	570	308	2,720	1.10	70.85
100	587	771	585	6,470	2.05	71.80
Year	**L/s per ha (4)**	**L/s per ha (5)**	**L/s per ha (4)**	**m^3 per ha (6)**		
2	4.5	3.7	3.2	173		
5	6.5	6.5	4.2	212		
10	8.0	8.7	5.2	236		
25	9.7	11.3	6.1	273		
100	11.7	15.3	11.6	650		

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

(2) Existing Conditions Peak Flow to Lannan Rd from Crown Jewel Drainage System, 3200 Majestic Drive, Proposed 56 Lot Subdivision, April 1, 2021 – Table 8 (see copy in **Appendix B**).

(3) Based on a dry pond lowest elevation = 69.75 m

(4) Based on a total pre-development catchment area = 50.3 ha as noted in Crown Jewel Drainage System, 3200 Majestic Drive, Proposed 56 Lot Subdivision, April 1, 2021 – Table 8 (see copy in **Appendix B**).

(5) Based on a total developed catchment area = 50.25 ha (40.30 ha upstream of Lake 4B plus 9.95 ha upstream of Lannan Road) as shown in **Figure 7**.

(6) Based on a developed catchment area of 9.95 ha, downstream of Lake 4B and upstream of Lannan Road as shown in **Figure 7**.

(7) Post development peak flows, water depths and storage volumes assume the future development properties along Royal Vista Way, north of the detention pond will be developed as multi-family and will include detention storage and controls meeting Bylaw No. 2919 standards.

(8) This pond was modelled with a capacity of 7,800 m3 at a depth of 2.35 m. Peak flows, storage volumes and water depths to be confirmed during detailed design.

6.4 Ministry of Transportation & Transit Requirements

The preliminary design of the detention pond and its flow control structure indicate post development peak flows can be reduced to pre-development peak flow rates for each of the design return periods (2 year, 5 year, 10 year, 25 year, 50 year, and 100 year) for the City's design hyetograph. The intent is that the proposed system will be designed to meet MoTT's requirements for:

- run-off controls to limit post-development peak discharge rates to the pre-development rates for 5 year return periods.
- not increasing downstream flooding or stream erosion.
- not adversely affecting the receiving ditch or channel where un-attenuated flood waters in excess of the 5 year discharge by-pass the detention facility

Providing the detention pond with an emergency spillway would meet MoTT's recommendation for:

- an unconfined emergency spillway capable of passing a 100 year peak discharge to direct overflow safely into the downstream watercourse.

The City's design hyetograph inclusion of a 15% allowance for potential climate change would appear to meet MoTT's requirement to:

- give reasonable consideration of the impacts of climate change and weather extremes appropriate to the scale of the project (including, new, rehabilitation, and maintenance projects).

6.5 Infiltration & Volume Reduction

To enable design consistency along Lannan Road and Road A, the infiltration facilities proposed for the Brooklyn Creek catchment are also proposed for the local roads and single-family lots within the Little River catchment area, even though they are not specifically required by the City or MoTT.

Infiltration areas, in the form of bio-swales/rain gardens, and infiltration trenches are intended to detain stormwater runoff within the developed areas and allow time for the flow to infiltrate into the ground.

On private property, infiltration systems could include, but are not limited to; minimum thickness (typically 300 mm) of absorbent topsoil, surface discharge of roof gutter leaders and/or roof leaders discharging to an infiltration trench/rock pit, pervious driveway surfaces and hydraulically disconnected driveway surfaces).

Within public road allowances, infiltration systems include boulevard rain gardens/bio-swales with infiltration volume and infiltration areas.

Figure 2 shows the approximate locations of the bio-swale/rain gardens and the infiltration trenches. It is important to note that the locations and sizes of these facilities shown on **Figure 2** are conceptual and will change during detailed design when more information is available and when other third party utilities have been designed.

Figure 5 presents a typical local road cross section and plan view showing how infiltration and volume reduction systems might be implemented on private property and within the public road allowance.

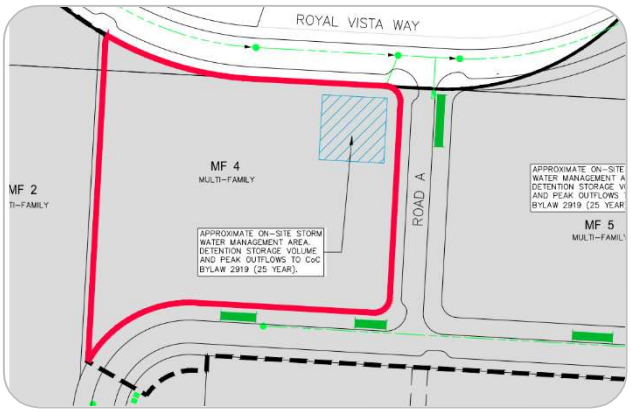
6.6 Multi-Family Development Sites

There are two proposed multi-family development sites (MF 4 and MF 5) within the proposed development that are located within the Little River catchment. Both sites will be responsible for constructing storm water management facilities to meet the regulatory requirements of the City of Courtenay Bylaw No. 2919.

The data presented for each proposed detention and infiltration facility are preliminary, based on an assumed percent impervious area and storage / controls configurations. Actual storage volumes and peak flows are to be confirmed during detailed design when more data is available.

6.6.1 MF 4 Proposed Multi-Family Site, Royal Vista Way

This 1.05 ha site (see **Figure 2**) will have the benefit the large downstream detention pond adjacent to Lannan Road.



Storm water management controls for this site will need to meet the City of Courtenay standards for detention storage volumes. It is assumed that the low spot in the northeast corner of the site will be used for a detention facility. However, the development of the site may lend itself to multiple storage locations.

The estimated pre and post development peak flows leaving the site and the estimated storage volumes required are presented in **Table 16**.

Table 16 – MF 4 Preliminary Peak Flows and Storage Volumes

Return Period Year	Pre-Development Peak Flow (1) L/s	Detention – Post Development		
		Peak Flow (1)		Storage Volume m^3
		In L/s	Out L/s	
2	12	45	12	230
5	21	83	16	345
10	27	111	25	395
25	43	151	38	430
100	69	214	58	490

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

Post-development peak flows, storage volumes, and detention controls are approximate and to be confirmed during detailed design.

6.6.2 MF 5 Proposed Multi-Family Site, Royal Vista Way and Road B

This 1.13 ha site (see **Figure 2**) will have the benefit the downstream detention pond adjacent to Lannan Road.

Storm water management controls for this site will need to meet the City of Courtenay standards for detention storage volumes. It is assumed that the low spot in the northeast corner of the site will be used for a detention facility. However, the development of the site may lend itself to multiple storage locations.

The estimated pre and post development peaks flow leaving the site and the estimated storage volumes required are presented in **Table 17**.

Table 17 – MF 5 Preliminary Peak Flows and Storage Volumes

Return Period	Pre-Development Peak Flow (1)	Detention – Post Development		
		Peak Flow (1)		Storage Volume
Year	L/s	In L/s	Out L/s	m^3
2	13	48	13	250
5	22	89	16	380
10	28	120	27	425
25	45	162	41	465
100	72	230	63	525

Notes:

(1) Peak Flows based on the City of Courtenay's design hyetograph (see **Figure 3**).

Post-development peak flows, storage volumes, and detention controls are approximate and to be confirmed during detailed design.

7 FINDINGS

7.1 Brooklyn Creek Catchment

7.1.1 Detention Pond Location

A location for a stormwater management pond has been proposed on The Park at Crown Isle property, located within the Comox Valley Regional District, Electoral Area B. A drainage ditch would be constructed to convey runoff from the proposed development to the proposed detention pond.

7.1.2 City of Courtenay Stormwater Management

Computer modelling results indicate a detention pond is required to reduce post development peak flows to pre-development peak flows. The pond outlet structure will need to be equipped with flow control orifices to manage flows from the 2 year to 25 year return period.

For the City's design hyetograph, computer modelling indicates that a storage volume in the 3,500 m^3 to 4,000 m^3 range should provide sufficient storage to control peak flows to the design pre-development rates for the 25 year return period.

7.1.3 Anderton Corridor Servicing Study Stormwater Management

The Anderton Corridor Servicing Study (ACSS) utilized a water balance approach for stormwater management. The study sets design targets for infiltration area, infiltration volume and stormwater detention for a per unit 100 year peak flow, based on overall impervious area resulting from the proposed development. Historical rainfall data was used in the development of the design targets.

For the portion of the development that is within the Brooklyn Creek catchment area, a preliminary estimate in the range of 3,200 m^3 to 3,700 m^3 of storage would be required in addition to the 1,300 to 1,500 m^2 of infiltration area to manage runoff up to the 100 year return period. For the 100 year return period, the design targets for the detention pond are a storage volume of 475 m^3/ha and a peak discharge flow rate of 16.1 L/s per ha for a post development catchment area.

7.1.4 Ministry of Transportation & Transit Stormwater Management

The preliminary design of the detention pond and its flow control structure indicate post development peak flows can be reduced to pre-development peak flow rates for each of the design return periods (2 year, 5 year, 10 year, 25 year, 50 year, and 100 year) for the City's design hyetograph. The intent is that the proposed system will be designed to meet MoTT's requirements for:

- run-off controls to limit post-development peak discharge rates to the pre-development rates for 5 year return periods.

- not increasing downstream flooding or stream erosion.
- not adversely affecting the receiving ditch or channel where un-attenuated flood waters in excess of the 5 year discharge by-pass the detention facility.

The detention pond with an emergency spillway would meet MoTT's recommendation for:

- an unconfined emergency spillway capable of passing a 100 year peak discharge to direct overflow safely into the downstream watercourse.

The City's design hyetograph inclusion of a 15% allowance for potential climate change would appear to meet MoTT's requirement to:

- give reasonable consideration of the impacts of climate change and weather extremes appropriate to the scale of the project (including, new, rehabilitation and maintenance projects).

7.1.5 Multi-Family Development Sites

On-site storm water management features are required on each multi-family site in the Brooklyn Creek catchment area in accordance with City Bylaw 2919 and the ACSS.

The multi-family site MF 1 (Brittania) will require 100 year detention storage along with infiltration area and volume (ACSS) because it does not drain into the larger downstream pond that receives drainage from MF 2 and MF 3.

The multi-family sites MF 2 (Royal Vista Way) and MF 3 (Lannan Rd) will require 25 year detention storage because it drains into the large downstream detention pond to be located on The Park at Crown Isle property. These sites will also require infiltration area and volume (ACSS).

7.1.6 Parry Place Storm Sewer

The proposed storm sewer will convey flows through the Parry Place road allowance to Brooklyn Creek. We understand the City of Courtenay will own and maintain this storm sewer.

7.2 Little River Catchment

7.2.1 Detention Pond Location

A location for a stormwater management pond has been proposed in the natural low lying area in the northeast corner of the property. It will receive flows from this proposed residential development and lands yet to be developed to the east and south of Lake 4B that do not drain into Lake 4B, as well as flows discharged from Lake 4B. The pond will regulate all flows from Crown Isle that enter the existing drainage ditch at the top (west) end of Lannan Road.

7.2.2 City of Courtenay Stormwater Management

Computer modelling results indicate a detention pond is required to reduce post development peak flows to pre-development peak flows. The pond outlet structure will need to be equipped with flow control orifices to manage flows from the 2 year to 100 year return period. For the City's design hyetograph, computer modelling indicates that a storage volume in the range of 2,500 m^3 to 3,000 m^3 should provide sufficient storage for the 25-year return period.

7.2.3 Ministry of Transportation & Transit Stormwater Management

The preliminary design of the detention pond and its flow control structure indicate post development peak flows can be reduced to pre-development peak flow rates for each of the design return periods (2 year, 5 year, 10 year, 25 year, 50 year, and 100 year) for the City's design hyetograph. The intent is that the proposed system will be designed to meet MoTT's requirements for:

- run-off controls to limit post-development peak discharge rates to the pre-development rates for 5 year return periods.
- not increasing downstream flooding or stream erosion.
- not adversely affecting the receiving ditch or channel where un-attenuated flood waters in excess of the 5 year discharge by-pass the detention facility.

Providing the detention pond with an emergency spillway would meet MoTT's recommendation for:

- an unconfined emergency spillway capable of passing a 100 year peak discharge to direct overflow safely into the downstream watercourse.

The City's design hyetograph inclusion of a 15% allowance for potential climate change would appear to meet MoTT's requirement to:

- give reasonable consideration of the impacts of climate change and weather extremes appropriate to the scale of the project (including, new, rehabilitation and maintenance projects).

7.2.4 Multi-Family Development Sites

On-site storm water management features are required on each multi-family site in accordance with City bylaw 2919. The multi-family sites MF 4 and MF 5 will require 25 year on site detention storage.

APPENDIX A

Parry Place Storm Sewer – Preliminary Design
Drawings 9109-181P-01 to -03,
January 6, 2025

LEGEND

EXISTING	DESCRIPTION	PROPOSED
W 200ø PVC	WATERMAIN (SIZE NOTED)	
	WATER SERVICE & METER	
	FIRE HYDRANT	
S 200ø PVC	SANITARY SEWER (SIZE NOTED)	
S	SANITARY MANHOLE	
D 900ø CONC	STORM DRAIN (SIZE NOTED)	D 750ø CONC
D 800ø CSP	CULVERT (SIZE NOTED)	
D	STORM DRAIN MANHOLE	D
	CULVERT HEADWALL	
	CATCH BASIN	
	CATCH BASIN – TYPE 2	
	DITCH/SWALE	
	ELECT. JUNCTION BOX	
	UG ELECTRICAL CONDUIT	
	STREET LIGHT	
	SIGN	
	EDGE OF PAVEMENT	
	TOP OF SLOPE	
	TOE OF SLOPE	
X	FENCE	
	TREE/TREELINE	

DRAWING LIST

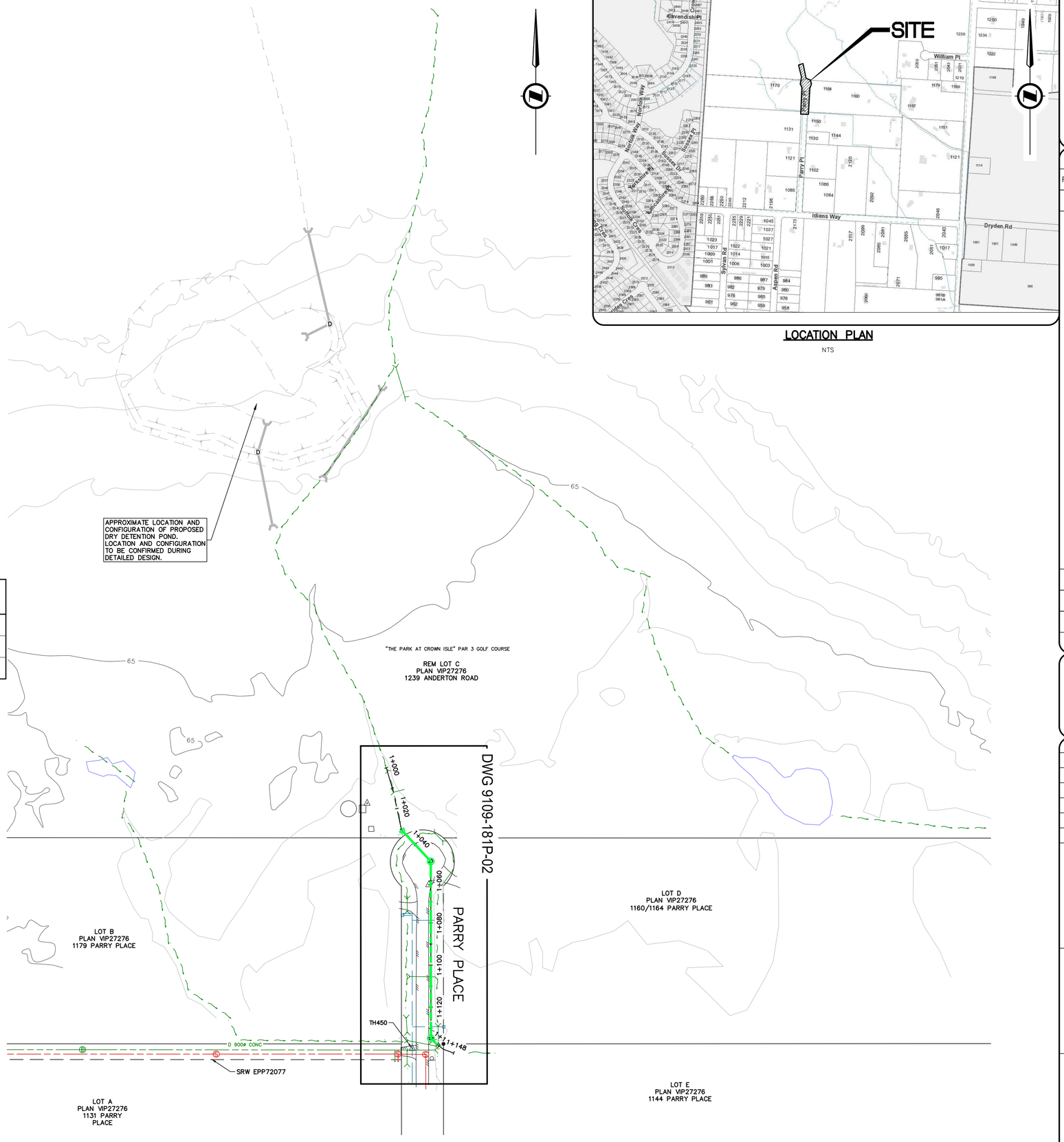
DWG. No.	DESCRIPTION
9109-181P-01	KEY PLAN, LOCATION PLAN, LEGEND, DRAWING LIST AND NOTES
9109-181P-02	PARRY PLACE STORM SEWER PLAN & PROFILE
9109-181P-03	TYPICAL SECTIONS AND CROSS SECTIONS

GENERAL NOTES

1. ALL ELEVATIONS ARE TO METRIC GEODETIC DATUM, DERIVED FROM TRAVERSE HUB TH450, LOCATED ON PARRY PLACE, ELEV. 62.300m.
2. ALL STORM SEWER WORK IS TO BE IN ACCORDANCE WITH:
   2.1. CITY OF COURTENAY SUBDIVISION AND DEVELOPMENT BYLAW 2919.
   2.2. ROAD RESTORATION WORK IS TO BE IN ACCORDANCE WITH THE CURRENT VERSION OF MoTI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION UNLESS OTHERWISE NOTED.
   2.3. WATER SERVICE RELOCATION WORK IS TO BE IN ACCORDANCE, AND COORDINATED WITH THE COMOX VALLEY REGIONAL DISTRICT.
3. LOCATION OF EXISTING UTILITIES SHOULD BE CONSIDERED APPROXIMATE ONLY, AND MANUALLY CONFIRMED BY THE CONTRACTOR IN THE FIELD PRIOR TO CONSTRUCTION.
4. ALL DISTURBED AREAS ARE TO BE RESTORED TO EQUAL OR BETTER CONDITION THAN EXISTING.
5. IF UNSUITABLE MATERIAL IS FOUND IN THE ROAD OR TRENCH SUBGRADE, THE GEOTECHNICAL ENGINEER IS TO REVIEW AND ACCEPT THE SUBGRADE PRIOR TO THE PLACEMENT OF SUBBASE GRAVELS OR INSTALLATION OF PIPE.
6. THE CONTRACTOR SHALL ENSURE THAT ALL ENVIRONMENTAL PROTECTIONS TO ELIMINATE DOWNSTREAM SILTATION ARE IN PLACE PRIOR TO THE START OF CONSTRUCTION AND REMAIN FOR THE DURATION OF THE CONTRACT.
7. CONTRACTOR TO CALL "BC ONE CALL" TO LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION.

STORM SEWER NOTES

1. ALL STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS OF THE CITY OF COURTENAY SUBDIVISION AND DEVELOPMENT BYLAW 2919, UNLESS OTHERWISE SPECIFIED.
2. ALL PIPE SHALL BE BEDDED AND BACKFILLED IN ACCORDANCE WITH THE CITY ENGINEERING STANDARDS AND SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED. ALL BACKFILL WILL BE IMPORTED GRANULAR MATERIAL. BEDDING AND BACKFILL MATERIALS SHALL BE COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR UNLESS OTHERWISE SPECIFIED ON THE APPROVED ENGINEERING DRAWINGS.
3. ALL BEDDING AND BACKFILL SHALL BE SPOT TESTED FOR COMPACTION WITH A NUCLEAR DENSOMETER. FREQUENCY OF TESTING SHALL BE COMPLETED IN ACCORDANCE WITH BYLAW 2919.
4. ALL STORM AND SEWER PIPE (MAINLINE AND SERVICES) SHALL BE THOROUGHLY FLUSHED AND VIDEO INSPECTED FOLLOWING INSTALLATION.
5. ALL STORM SEWER INSTALLATIONS ARE VIDEO CAMERA INSPECTED AND SUBMITTED FOR REVIEW ONE MONTH PRIOR TO EXPIRY OF THE WARRANTEE PERIOD.



LOCATION PLAN
NTS

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RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	06JAN25	RC	CH	UPDATED PSMMP

NOT FOR CONSTRUCTION

ISS	DATE	BY	ENG	DESCRIPTION
B	11MAR24	RC	CH	PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN
A	13APR23	RC	CH	CLIENT REVIEW

RECORD OF ISSUE

SEAL

PRELIMINARY
January 07, 2025

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC/CH
CHECKED	CH
APPROVED	RH
DATE	MARCH 2023
SCALE	1:1000

CLIENT

SILVERADO LAND CORPORATION

PROJECT

PARRY PLACE STORM SEWER

TITLE

KEY PLAN, LOCATION PLAN, LEGEND, DRAWING LIST AND NOTES

DRAWING No.	REV.	SHEET
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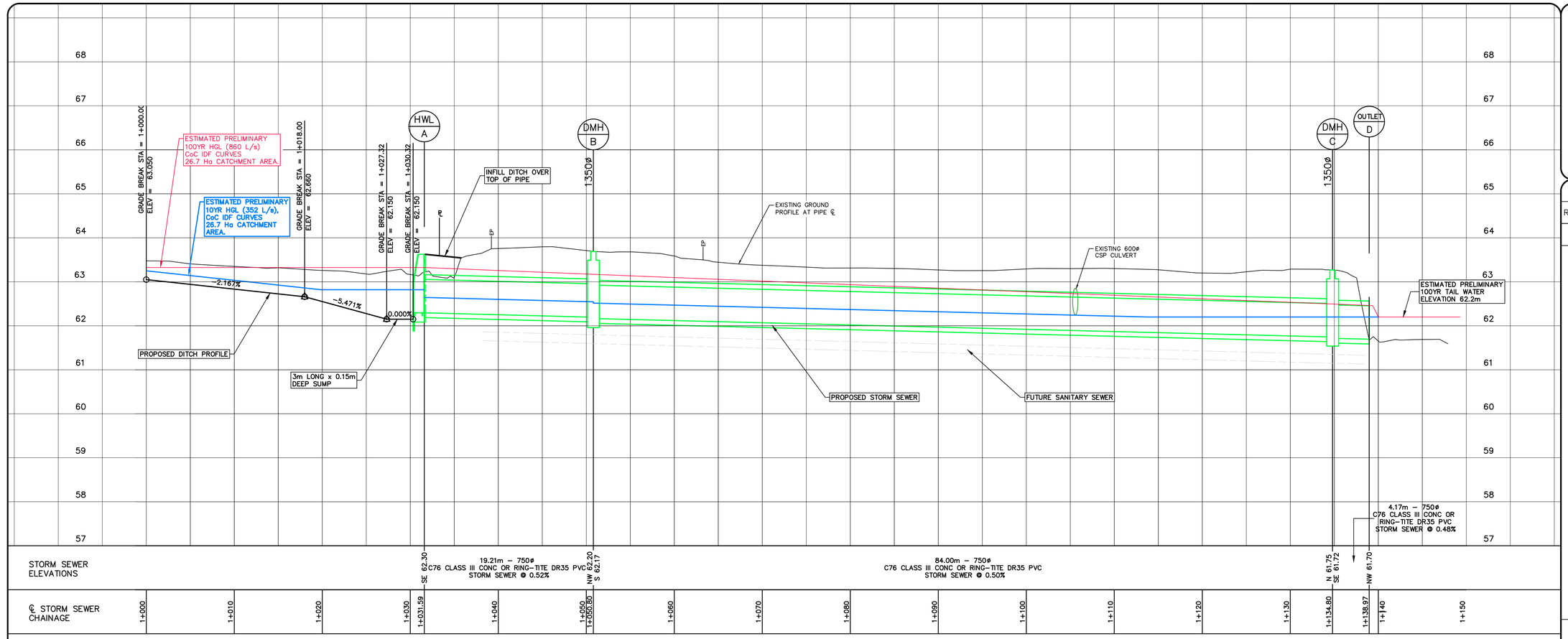

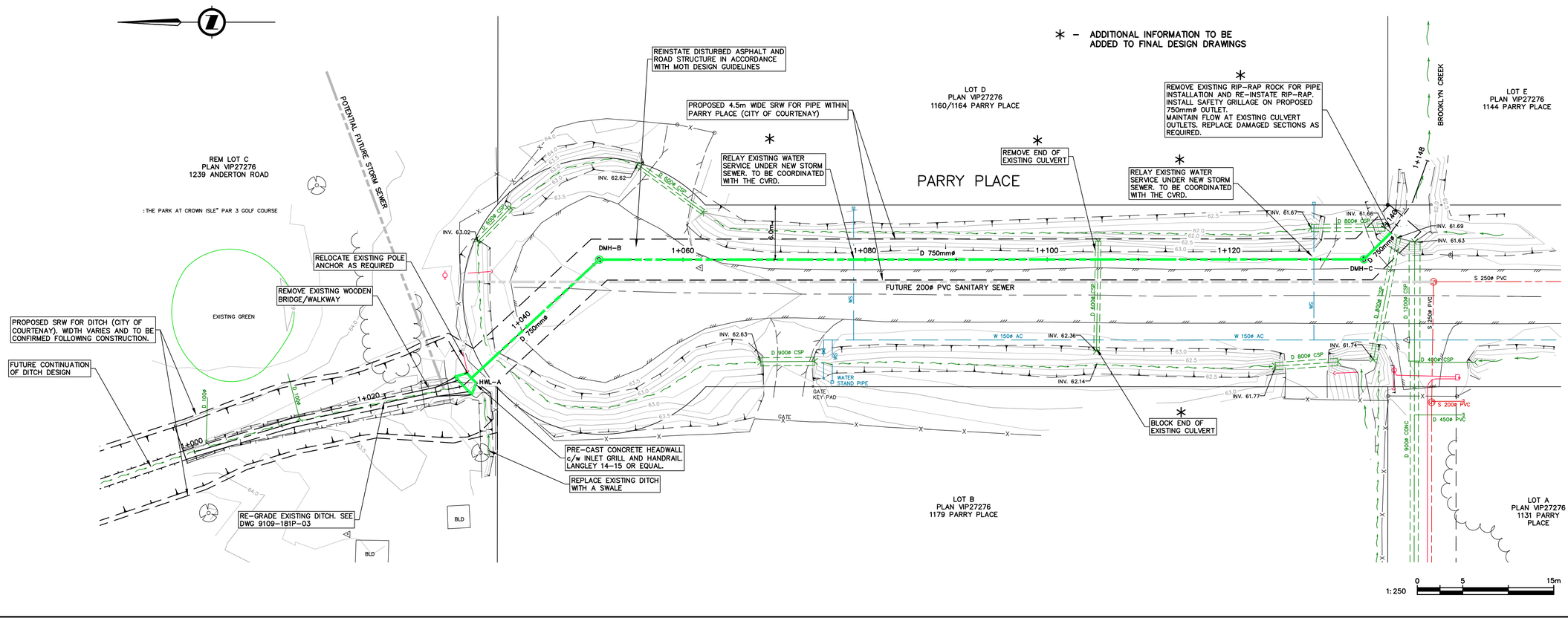

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REV	DATE	BY	ENG	DESCRIPTION
1	06JAN25	RC	CH	UPDATED PSMMP

NOT FOR CONSTRUCTION

ISS	DATE	BY	ENG	DESCRIPTION
B	11MAR24	RC	CH	PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN
A	13APR23	RC	CH	CLIENT REVIEW

RECORD OF ISSUE

SEAL

PRELIMINARY
January 07, 2025

PROJECT NO.	9109-181
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CHECKED	CH
APPROVED	RH
DATE	MARCH 2023
SCALE	1:250H, 1:50V

CLIENT

SILVERADO
LAND CORPORATION

PROJECT

PARRY PLACE
STORM SEWER

TITLE

PARRY PLACE
STORM SEWER
PLAN & PROFILE

DRAWING No.	REV.	SHEET
9109-181P-02	1	2/3

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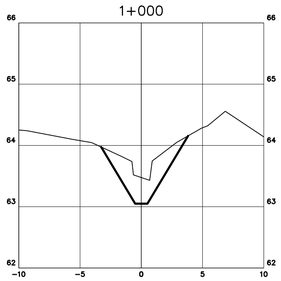
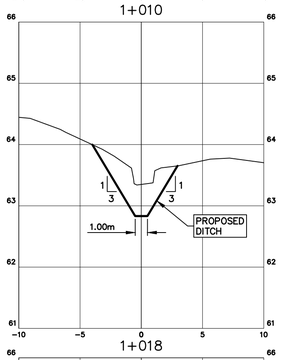
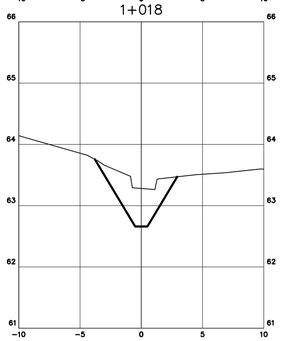
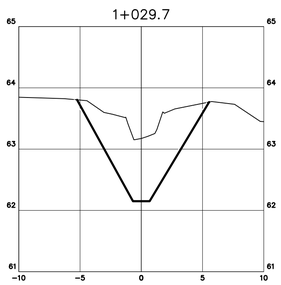
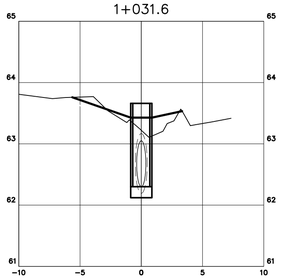
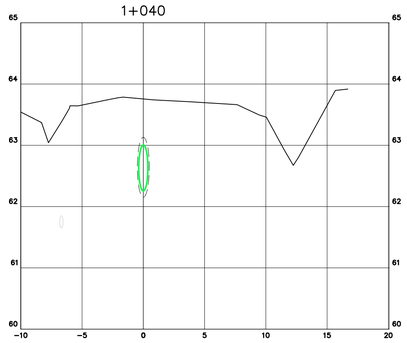


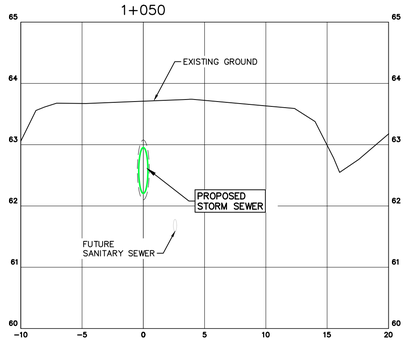


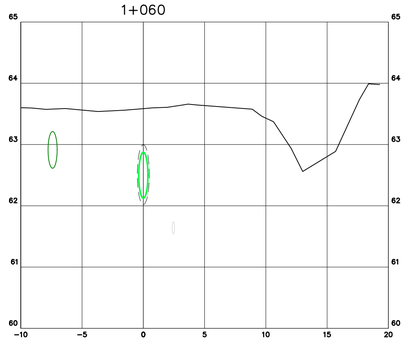


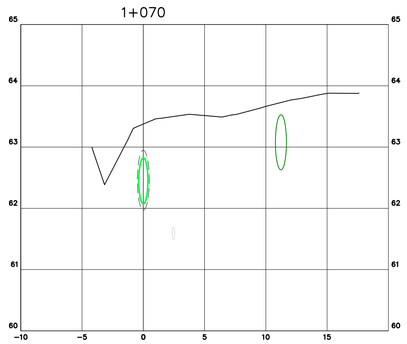


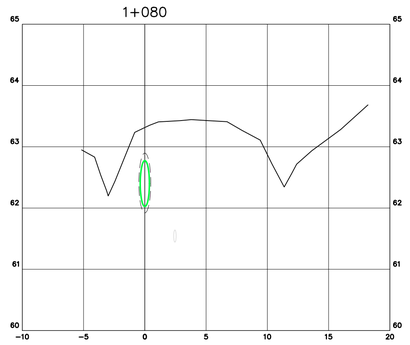


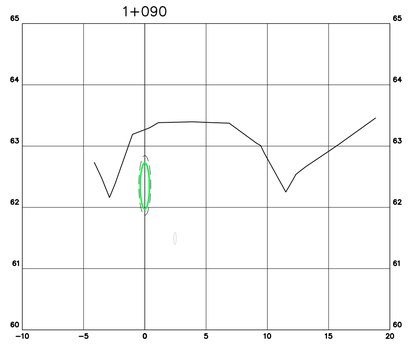


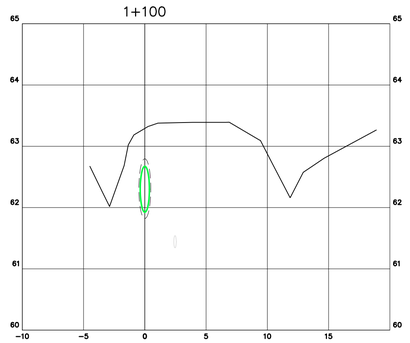


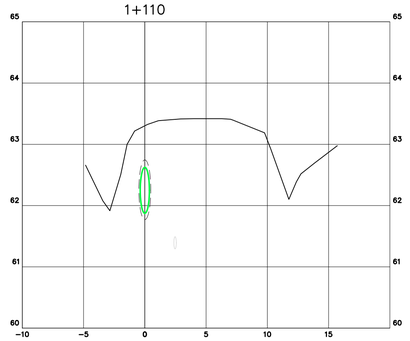


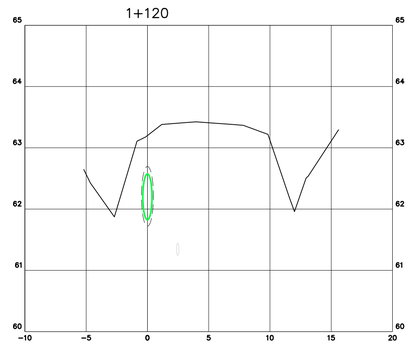


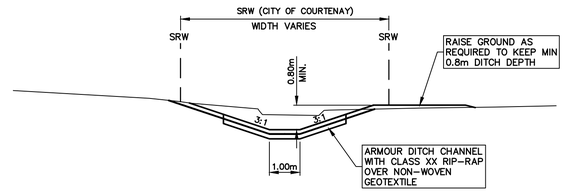






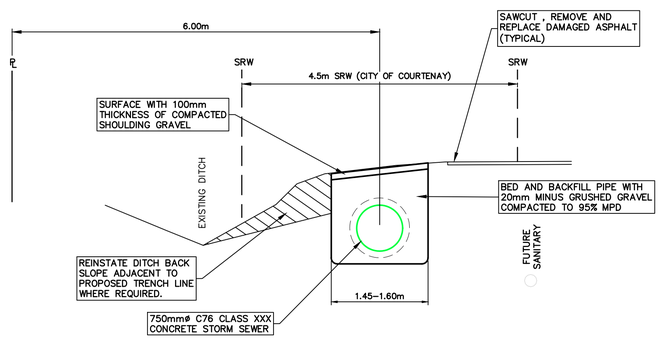






TYPICAL DITCH SECTION
1+000 TO 1+031

1:100



TYPICAL TRENCH SECTION
1+031 TO 1+140

1:50

KOERS
& ASSOCIATES
ENGINEERING LTD.
Consulting Engineers
P.O. Box 790, 194 Memorial Ave. Ph: 250-248-3151
Parksville, BC V9P 2G8 www.koers-eng.com Fax: 250-248-5362

RECORD OF REVISIONS

REV	DATE	BY	ENG	DESCRIPTION
1	06JAN25	RC	CH	UPDATED PSMMP

NOT FOR CONSTRUCTION

ISS	DATE	BY	ENG	DESCRIPTION
B	11MAR24	RC	CH	PRELIMINARY STORMWATER MANAGEMENT MASTER PLAN
A	13APR23	RC	CH	CLIENT REVIEW

RECORD OF ISSUE

SEAL

PRELIMINARY
January 07, 2025

PROJECT NO.	9109-181
DRAWN	RC
DESIGNED	RC/CH
CHECKED	CH
APPROVED	RH
DATE	MARCH 2023
SCALE	1:250 H, 1:50V

CLIENT

SILVERADO
LAND CORPORATION

PROJECT

PARRY PLACE
STORM SEWER

TITLE

TYPICAL SECTIONS
AND CROSS SECTIONS

DRAWING No.	REV.	SHEET
9109-181P-03	1	3/3

APPENDIX B

Crown Jewel Drainage Study
(3200 Majestic Drive – Proposed 56 Lot Subdivision), April 1, 2021

- Table 7 – Lake 4 Drainage system Peak Discharge, Water Level & Storage Volumes, Existing Condition & After Crown Jewel Development – Comox Airport IDF Curves
- Table 8 – Lake 4 Drainage System Peak Discharge, Water Level & Storage Volumes, Existing Condition & After Crown Jewel Development – Courtenay IDF Curves

Table 7 – Lake 4 Drainage System Peak Discharge, Water Level & Storage Volumes, Existing Condition & After Crown Jewel Development - Comox Airport IDF Curves

Description	2 Year			5 Year			10 Year			25 Year			100 Year			100 Year + 10%		
	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change
Peak Discharge, L/s																		
Lake 2																		
- to block 72	0		0	0		0	13		-13	116		-116	307		-307	423		-423
- to Lake 3	63	134	71	63	181	118	63	209	146	63	253	190	63	404	341	63	486	423
Lake 2 total	63	131	71	63	181	118	76	209	133	179	253	74	370	404	34	476	486	10
Lake 3	80	131	51	113	136	23	114	139	25	116	144	28	129	337	208	165	489	324
Lake 4a	114	97	-17	139	113	-26	169	124	-45	183	137	-46	202	208	6	235	257	22
Lake 4b	121	79	-42	140	91	-49	166	97	-69	173	103	-70	173	115	-58	195	126	-69
Total to Lannan Rd	165	107	-58	207	162	-45	305	207	-98	348	261	-87	369	340	-29	388	374	-14
Peak Unit Rate Discharge to Lannan Rd, L/s per ha																		
Catchment Area, ha	50.3	53.25		50.3	53.25		50.3	53.25		50.3	53.25		50.3	53.25		50.3	53.25	
L/s per ha	3.3	2.0		4.1	3.0		6.1	3.9		6.9	4.9		7.3	6.4		7.7	7.0	
Peak Water Level, m																		
Lake 2	73.72	73.22	-0.40	74.00	73.39	-0.61	74.19	73.51	-0.68	74.27	73.65	-0.62	74.35	73.77	-0.58	74.38	73.84	0.46
Lake 3	72.88	73.01	0.13	72.91	73.20	0.29	72.95	73.33	0.28	73.02	73.49	0.47	73.11	73.66	0.55	73.14	73.68	0.54
Lake 4a	72.14	72.17	0.03	72.16	72.34	0.18	72.28	72.42	0.14	72.36	72.52	0.16	72.41	72.74	0.33	72.58	72.91	0.33
Lake 4b	72.13	72.16	0.03	72.14	72.32	0.18	72.25	72.40	0.15	72.33	72.50	0.17	72.37	72.71	0.34	72.54	72.90	0.34
800 CSP	69.93	69.83	-0.10	69.99	69.92	-0.07	70.13	69.99	-0.14	70.19	70.09	-0.10	70.24	70.19	-0.05	70.29	70.28	-0.01
Peak Storage Volume, m3																		
Lake 2	5,030	2,240	-2,790	6,680	3,160	-3,520	7,570	3,810	-3,760	7,570	4,620	-2,950	7,570	5,320	-2,250	7,570	5,740	-1,830
Lake 3	460	1,200	740	630	2,280	1,650	860	3,020	2,160	1,250	3,930	2,680	1,770	5,060	3,290	1,940	5,200	3,260
Lake 4a	2,720	2,960	240	2,880	4,330	1,450	3,850	4,970	1,120	4,490	5,790	1,300	4,890	7,800	2,910	6,340	9,350	3,010
Lake 4b	1,460	1,600	140	1,510	2,350	840	2,020	2,720	700	2,400	3,190	790	2,580	4,160	1,580	3,370	5,050	1,680
Total Stored Volume, m3 and m3/ha																		
m^3	9,670	8,000	-1,670	11,700	12,120	420	14,300	14,520	220	15,710	17,530	1,820	16,810	22,340	5,530	19,220	25,340	6,120
Catchment Area, ha	40.2	43.15		40.2	43.15		40.2	43.15		40.2	43.15		40.2	43.15		40.2	43.15	
m^3/ha	240	185		290	280		355	335		390	405		420	520		480	590	

Notes:

1 Change = After Development – Existing Condition

2 For After Development estimates, Lake 2 outlet pipe to Lake 3 increased to convey all flows to Lake 3 and eliminating any flow to Block 72 (via the existing 300 CSP culvert under Ryan Road)

3 For Existing Conditions, when the water elevation in Lake 2 exceeds 74.15 m geodetic, water is anticipated to start to leave the Lake 2 catchment and flow northwest towards Ryan Road. For elevations above 74.15 m, the volume of stored water is shown to remain constant at 7,570 m^3 as the volume of water diverted out of the Lake 2 catchment is not included the analyses.

Table 8 – Lake 4 Drainage System Peak Discharge, Water Level & Storage Volumes, Existing Condition & After Crown Jewel Development - Courtenay Design Hyetograph

Description	2 Year			5 Year			10 Year			25 Year			100 Year		
	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change	Exist Cond.	After Dev.	Change
Peak Discharge, L/s															
Lake 2															
- to block 72	0		0	111		-111	222		-222	395		-395	774		-774
- to Lake 3	53	179	179	53	289	236	53	441	388	53	609	556	53	792	739
Lake 2 total	53	179	179	164	289	125	275	441	166	448	609	161	827	792	-35
Lake 3	104	133	29	122	275	153	150	435	285	219	650	431	348	992	644
Lake 4a	156	128	-28	189	268	79	214	357	143	252	601	349	537	988	451
Lake 4b	160	109	-51	179	134	-45	193	177	-16	212	211	-1	243	472	229
Total to Lannan Rd	224	174	-50	329	261	-68	401	331	-70	487	389	-98	587	482	-105
Peak Unit Rate Discharge to Lannan Rd, L/s per ha															
Catchment Area, ha	50.3	53.25		50.3	53.25		50.3	53.25		50.3	53.25		50.3	53.25	
L/s per ha	4.5	3.3		6.5	4.9		8.0	6.2		9.7	7.3		11.7	9.1	
Peak Water Level, m															
Lake 2	74.15	73.47	-0.72	74.27	73.72	-0.55	74.32	73.80	-0.52	74.38	73.93	-0.45	74.46	74.20	-0.26
Lake 3	72.92	73.40	0.48	73.05	73.64	0.59	73.14	73.67	0.53	73.17	73.71	0.54	73.21	73.90	0.69
Lake 4a	72.28	72.63	0.35	72.49	73.06	0.57	72.64	73.39	0.75	72.86	73.70	0.84	73.14	73.90	0.76
Lake 4b	72.23	72.60	0.37	72.43	73.06	0.63	72.57	73.39	0.82	72.78	73.70	0.92	73.14	73.90	0.76
800 CSP	70.04	69.96	-0.08	70.21	70.10	-0.11	70.37	70.21	-0.16	70.63	70.34	-0.29	70.97	70.61	-0.36
Peak Storage Volume, m3															
Lake 2	7,570	3,590	-3,980	7,570	5,030	-2,540	7,570	5,500	-2,070	7,570	6,270	-1,300	7,570	7,860	290
Lake 3	680	3,420	2,740	1,430	4,930	3,500	1,940	5,130	3,190	2,110	5,400	3,290	2,340	6,670	4,330
Lake 4a	3,850	6,790	2,940	5,560	10,790	5,230	6,890	14,480	7,590	8,890	18,700	9,810	11,610	21,690	10,080
Lake 4b	1,930	3,650	1,720	2,860	5,830	2,970	3,510	7,730	4,220	4,490	9,910	5,420	6,250	11,460	5,210
Total Stored Volume, m3 and m3/ha															
m^3	14,030	17,450	3,420	17,420	26,580	9,160	19,910	32,840	12,930	23,060	40,280	17,220	27,770	47,680	19,910
Catchment Area, ha	40.2	43.15		40.2	43.15		40.2	43.15		40.2	43.15		40.2	43.15	
m^3/ha	350	405		435	615		495	760		575	935		690	1,105	

Notes:

1 Change = After Development – Existing Condition

2 For After Development estimates, Lake 2 outlet pipe to Lake 3 increased to convey all flows to Lake 3 and eliminating any flow to Block 72 (via the existing 300 CSP culvert under Ryan Road)

3 For Existing Conditions, when the water elevation in Lake 2 exceeds 74.15 m geodetic, water is anticipated to start to leave the Lake 2 catchment and flow northwest towards Ryan Road. For elevations above 74.15 m, the volume of stored water is shown to remain constant at 7,570 m^3 as the volume of water diverted out of the Lake 2 catchment is not included the analyses.

APPENDIX C

Letter to Marianne Wade, City of Courtenay
from Brooklyn Creek Watershed Society, July 6, 2023.

Marianne Wade - Director of Development Services
City of Courtenay
830 Cliffe Avenue
Courtenay, BC V9N 2J7
Sent by email to Development@Courtenay.ca

6 July 2023

Dear Ms. Wade,

I am writing with regards to the revised submission of a plan for residential development on Crown Isle Property in the upper reaches of the Brooklyn Creek Watershed (the area that is often called the Lannon Lands).

On June 22, two members of our Board met with Rick Waldhaus of Silverado Land Corp to discuss this proposal. Mr. Waldhaus showed us maps of the area. He described how this plan will adopt modern approaches for integrated rainwater management that meet or exceed the standards required by The City of Courtenay, the Regional District, and The Town of Comox. We discussed the overall Brooklyn Creek Watershed and how, hopefully, this plan will provide managed water inputs that better supports year-round waterflow.

Members of the Brooklyn Creek Watershed Society do not have the technical expertise to approve or disapprove of this proposal. We trust that The City will provide or require professional oversight. We appreciate the communication we are having with Mr. Waldhaus. We hope to continue this communication and work together to support fish and riparian habitat in the entire Brooklyn Creek Watershed.

In 2021, we partnered with the Town of Comox and the Pacific Salmon Foundation to pay for Level One Fish Habitat Assessment of Brooklyn Creek, downstream of Anderton Road (https://brooklyncreek.ca/reports/). At the same time, Silverado Land Corp commissioned their consulting engineers, Koers & Associates Engineering Ltd., to produce a report describing the hydrological inputs from the Crown Isle area into the upper Brooklyn Creek watershed. This report is also on our website. We appreciate the spirit of cooperation shown by Mr. Waldhaus and Silverado Land Corp on this matter.

Our goal is to commission a similar Level One Fish Habitat Assessment of Brooklyn Creek upstream of Anderton Road to inform us of habitat restoration and protection measures for this section of the watershed. We hope to work with Silverado Land Corp, The City of Courtenay, the Comox Valley Regional District, local residents and granting agencies to accomplish this goal. Our longer term goal is develop a Brooklyn Creek management plan comparable to the 100 year Bowker Creek plan in The Capital Regional District (https://www.crd.bc.ca/bowker-creek-initiative/about-bci/plans-and-strategies/bowker-creek-blueprint-a-100-year-plan)

Best Regards,

Christine Hodgson
President, Brooklyn Creek Watershed Society

Cc: Rick Waldhaus, Silverado Land Corp

APPENDIX D

City of Courtenay Staff Review Comments
June 5, 2024

1. General Comments
    a. Lot layout maps and other maps are inconsistent need to work from a base map that aligns with Zoning Bylaw Map and reflects concept plan, need close attention to ensure that these are consistent with each other.
    b. There is no reference plan which is required for adoption documents.
    c. A subdivision plan will be required for creation of the development plan to coordinate with the Zoning Amendment Bylaw Map. Some language has been added to the May 31, 2024 revised DA.

2. Street Hierarchy/Active Transportation Preliminary Master Plan, March 13 2024, Westplan Consulting
    a. TIA:
        i. The Street Hierarchy / Active Transportation Preliminary Master Plan makes note of a Basic Transportation Review that will be submitted as part of each subdivision phase, but without an indication that a site-wide TIA will be produced. The City requires a site-wide TIA to help understand impacts on the surrounding street network. Language to this effect is in the May 31, 2024 revised DA.
        ii. This includes understanding of anticipated total site trip generation and trip distribution needed to understand impacts on surrounding network.
            1. What portion of trips will use Royal Vista Way / Ryan Road, Lannan Road / Anderton Road, or other routes
                a. MOTI likely wanting to understanding loading on Royal Vista Way / Ryan Road and Lannan Road / Anderton Road intersections
                b. Expectation that Royal Vista Way / Ryan Road will be signalized in future and that applicant should contribute toward costs
            2. Understanding of anticipated volumes on internal street is needed to confirm appropriate street classifications and cross-sections
                a. Desire to see sidewalks on both sides if Local Road volumes approach upper end of target volumes for classification (typically < 1,000 vpd)
    b. Cycling:
        i. Further consideration of site cycling opportunities needed relative to the City's overall Cycling Network Plan (CNP).
        ii. The section of Royal Vista Way west of the site is identified in the CNP as a Neighbourhood Bikeway and should be extended further east for the sections contained within the development
        iii. Dedicated cycling facilities (i.e., protected bike lanes, buffered bike lanes) are best practice for major roads given high traffic volumes and should be considered here. Royal Vista Way is proposed as a Collector Road and

consideration should be given to using cross-section CSSD CRD (www.courtenay.ca/EN/main/community/transportation/cycling-in-the-comox-valley.html), which includes dedicated cycling facilities.

c. Cross sections:
    i. Figure 3 in Koers Infrastructure matches with Figure 2 in Westplan Transportation Hierarchy – shows bioswale facilities
        1. City request 1.8-2.0m sidewalks (not 1.5m).
        2. Currently working on alternative local road cross-section for Phase VI and should be consistency with cross-section
        3. SDS to be amended to updated to permit this, and create a new standard.
    ii. Observing that McElhanney is designing in Phase 6 (north CI) and Koers is designing here – road cross sections need to be consistent.
    iii. MOTI will need this as part of signing the Bylaw (800m of controlled highway).

3. Preliminary Infrastructure Master Plan – March 14, 2024, Koers & Associates Engineering
    a. Modeling for both water and sanitary appear to be not included in this report. These will need to be undertaken and some language has been incorporated into May 31, 2024 revised DA.
    b. Capacity of CVRD's facilities and City's need to be factored to understand any constraints that may be generated by proposed development.
    c. Koers report indicates that constraints on the water system may not be sufficient for fire flows for example. Koers report needs to confirm fire flow capacity for proposed development.

4. Preliminary Stormwater Management Master Plan, March 14 2024, Koers & Associates Engineering
    a. In general, this is a preliminary plan that does not propose a specific design, and it raises a number of questions related to jurisdiction and land access. This may require legal guidance, and SRW's to resolve. Detailed comments below:
        1. Noted that latest version of layout/storm directions is favored as pre/post dev flows will remain same (previous version diverted some of Brooklyn's flow into Little River).
        2. Section 3.1.1 - Basements/crawlspaces should be avoided if it will require the conveyance of flows beyond the 10-year storm event.
        3. Section 5.1.1 - It is expected that there will substantially more stormwater conveyed through the private property located at 2205 Galleon Way. We may need an agreement/SRW across this property to avoid liability issues.
        4. Section 5.2 - The ownership, and maintenance responsibility of the stormwater pond on private property, within the CVRD needs to be confirmed. There may be legal/jurisdictional issues.

1. Recommended that City extend the blanket SRW Rich negotiated with Crown isle to cover all new stormwater infrastructure and the flow path of stormwater. This includes ponds, rain gardens, bioswales, ditches and utility corridors.

5. This report does not present a specific design or a commit to achieving particular standards. It calculates pond sizing using a couple of different methods, and summarizes these findings.
    1. Section 5.3 does not specify the final capacity of the stormwater pond.
    2. Section 6.5 - describes a variety of infiltration and volume reduction systems - These approaches would be beneficial across all phases of the development. The report is unclear about if and where these measures will be implemented.
    3. Section 7.1.2 and Section 7.1.3 indicate different design targets for the detention pond. It is unclear what is proposed for development.
6. Section 5.7 - it is proposed that flows released from the detention pond will be conveyed within the Parry Place road allowance in an enclosed storm sewer that is owned and maintained by the City of Courtenay.
    1. This area is outside our municipal boundary, require an SRW/Easement to maintain this infrastructure
    2. Has it been demonstrated that the existing ditches have the capacity to carry the 2024-06-05100-year flow path? Verify that the culverts in this ditch are sized for this, and will not cause flooding to private property along Parry Place.
7. Section 6.1 - who will own and maintain stormwater management facilities on multi-family lots? Require an SRW for the City to maintain this proposed infrastructure.
8. Section 6.6.1 - Table 16 and 17 present post development peak flows, storage volume and detention controls. The statement under these tables suggests that the values presented in Table 16 and 17 are estimates and are not based on site conditions.
9. MOTI has indicated they want a SRW from Pond 20 to Parry Place to be formalized.

5. Environmental Master Plan, March 2024, Corvidae Environmental Consulting
    a. The report is high level environmental overview of the property.
    b. The report identifies a variety of environmentally sensitive areas along the southern boundary of the property however, does not delineate the written breakdown into mapping graphics provided.
    c. ESA's in the report are based upon trembling aspens as presented in figure 2 but do not address the other ESA types noted in the report. Historical (2004) provincial Sensitive Ecosystem Inventory (SEI) information shows that all of Lannan RZ property was previously designated SEI (both Older Forest and Wetland Ecosystem).

d. The ESA need to be defined and mapped to determine the total area of ESA in the southern portion of the property. This will influence what will be ESA and what will be park. Further work is needed to determine this.
e. Two waterbodies (streams) are delineated in Figure 2 however, are not given any riparian buffers identified as ESA.
f. Report is not clear on what is considered an ESA in terms of protection moving forward with the development.
g. Third party review identity's a need for a wildlife corridor, this needs further discussion and how best to address moving forward.
h. Please review the City's EIA TOR: https://www.courtenay.ca/assets/Departments/Development~Services/OCP~Update/OCP-DPAs-Zoning~July~2022/EIA%20TOR%20web.pdf
i. Not delineating the ESA in this report, leads to what can be defined as Park and what can not. This will impact where park will be located to meet the 5% park requirements for subdivision calculations to inform a table for the property in the DA. How to address this needs situation needs further discussion and how to achieve this requirement in moving the development forward for Council consideration.
j. Desire for City's third-party consulting biologist to conduct a site visit. Need to get permission from CI. Developer's biologist encouraged to attend.

6. Lannan Parks Master Plan, March 13 2024, Bloom Landscape Architecture
   a. Park should be dispersed throughout development. Visually/gathering central part of development.
   b. As a note, in crown isle we are lacking a community park and as per PRMP and OCP planning standards, we should have a community park within 800m of residents at a minimum size of 1ha
   c. Concern that neighbourhood parks is split across a road (is technically 2 parks). Not a safe/ideal alignment. And threshold size for a neighbourhood park should be met (in one size). Either combine all in one location, or make two neighbourhood parks, each with a min of .2ha) spread through the development
   d. As per environment section, need to ensure that actual ESAs are not counted as Park. DA to reflect that Park needs must be met if ESAs are more present on property than reflected at this time.
   e. Need to quantify how much of the interactive/nature interpretation is part of the linear southern park and not part of ESA/tree area. Need to confirm if treed area is ESA and therefore not appropriate for park or human use.
   f. Shows dog park, but no play structure – programming needs discussion. These should also not be next to ESAs (co-location challenges). Dog parks need to be separated from children play areas.
   g. Little park nodes do not meet any classifications in parks plan - are acceptable as they appear to be additional to the 5% + deferral requirements. They're ideal for specialized uses such as dog and gardens.
   h. The plan does not include the parkland deferral from previous phases. Staff have shared those deferral numbers separately.
   i. 5-minute radius number needs to be re-centered on the park. 2024/06/05
   j. Observed that DA proposes parks improvements instead of original plan of CACs ($250K) this requires further discussion and has revised language in the DA sent on May 31, 2024.

APPENDIX E

City Memorandum dated March 14, 2025
Review of January 23, 2025 Master Plan Resubmissions

The Corporation of the City of Courtenay

Memorandum

To: **Brian McCauley,** Crown Isle **File No.:**3360-20-1911/OCP00007

From: **Marianne Wade, Director of Development Services** **Date:** March 14, 2025

Subject: Review of January 23, 2025 Master Plan Resubmissions

This memo is in response to the revised master plan submission package received January 24, 2025.

ISSUE:

I. The Rezoning was for 330 units (122 Single Family and 208 Duplex or Multi-family), reference in related memos and master plans is for 225 units, this needs to be addressed.

II. Previous technical memos have referenced a growth rate / background traffic of 1.9%, the most recent annual growth rate for the City as outlined in the Complete Communities Growth Assessment is 2.6 %over the past 10 years (2014-2024) and the future growth rate projection is 2.5%. This significant difference needs to be addressed by the authors of the various reports and be used for all future reports/modeling. This is particularly relevant for the TIA model.

III. Geo Advise modelling needs to reflect the population growth of 2.5% and the 330 DU that the proposed zone permits. This is the highest and best use of the site permitted by the proposed zone and the master plans need to address development at this density.

IV. The development phasing plan utilized in the reports need to identify how the 330 DU are proportion on the master plan.

V. Tree Density Targets are not mentioned in the overview environmental assessment review or parks plan. Please include.

VI. We suggest you address road hierarchy, cross-sections in the PIMP for better coordination.

VII. December 20, 2021 TIA identifies Royal Vista Way at Ryan Road intersection needs to be constructed. This is not mentioned in the PIMP or SHATPMP. This requirement is to be incorporated and has been raise by MOTT in their March 12, 2025 email regarding this TIA which has been requested to be updated by MOTT which the city supports.

<u>Street Hierarchy/Active Transportation Preliminary Master Plan (SHATPMP) dated January 23, 2025</u>

VIII. Figures 3, 4, and 5 do not reflect the conversation we had on August 15, 2024 on the Britannia road revision. See Sketch plan provided by Crown Isle.

IX. Page 4. States ‘At a future date, when warranted by trip generation, Royal Vista Way will connect to Ryan Road. The Lannan Road Development proposed density does not trigger this connection.”

a. This statement is ***in contradiction*** to the December 20, 2021 *Crown Isle Development at Royal Vista Way Intersection-Traffic Impact Assessment* and the August 14, 2024 technical memo noted but does not discuss how the master plan will meet the requirements in either report. There are key infrastructure timelines that must be met and inform the DA. Table 39 indicates when Royal Vista Way is to be constructed by 2036.

X. MOTT has noted in their March 12 2025 memo that the December 20 2021 is outdated and needs to be updated with the correct development composition. This incudes Crown Isle as a whole and needs to align with the CD-1 zone.

XI. Further other subsequent memos from December 2022 and April 2023 are not noted or referred to in this master plan. This includes the agreed to intersections by MOTT and the associated maps which form the framework for the Lannan Master Plan and development agreement. MOTT raises this in their March 12 email. This needs to be incorporated into the MP.

XII. Please note the Appendix A dated August 14, 2024 technical memo is not aligned with the December 20, 2021 TIA and makes statements that are contradictory to the December 2021 TIA. The Royal Vista Way Intersection is to be constructed and signalized by 2036 based upon the TIA of December 20 2021 and subsequent agreements with MOTT. (There is an intersection plan that was agreed to). Any variation from this requires a TIA that supports deferral from 2036 that can be supported by both MOTT and City.

XIII. Additional considerations in the updated TIA as requested by MOTT and City for Royal Vista / Ryan intersection construction must considered and speak to the following related criteria:

i) Continuity of Active transportation with Royal Vista as a bikeway and connecting trails and MUP's.

ii) Emergency services secondary and tertiary routes considering response times. I.e. Lannan is a rural road in an adjacent jurisdiction providing slower response times and risks related to access through the road for emergency services. Furthmore, Royal Vista at Crown Isle (nearest intersection) is one access point, with Lannan as a substandard secondary access. Due to distance, traffic controls and road width/parking the City would expect Royal Vista / Ryan Road access to be provided as per the December 20, 2021 Table 39 which identifies 2036.

iii) Internal congestion impacts such as warrant for dedicated left turn lanes at Royal Vista and Crown Isle Dr at the terminus of Royal Vista

iv) The Impact to LOS at adjacent intersections (i.e. LOS improvement with construction of Royal/Ryan intersection for the 5,10,15,20 year and buildout horizons on Anderton/Ryan, Crown/Ryan) needs to be updated with population growth of today and the proposed 330 units.

v) Transit requires a viable through road to provide internal service to Crown Isle, the City in promoting expanded transit service requires a demand management report on provision of transit with the Royal/Ryan intersection which is discussed in the December 20. 2021 TIA and needs to be reflected in this master plan-what is the timing and coordination with BC Transit?

vi) Approximately 1,770 units (McElhanney TM Dec 20, 2021) will benefit from the Royal Vista Way/Ryan Road intersection. The cost of the intersection must be

distributed equitably. The applicant is to demonstrate/propose how to accomplish that so it can inform the development agreement.

XIV. Development Agreement to identify what phase the Royal Vista Way to Ryan Road connection will be made and the requirements for infrastructure at that time (predesign showing signalization, laning, pedestrian/cycle access, lighting, etc.)

XV. Road Network Master Plan to include the future alignment and provisions for 'protecting' the access corridor from the intersection of Royal Vista Way/Road 'B' to the intersection of Royal Vista Way/Ryan Road.

XVI. Page 4. States 'Both Royal Vista Way and Britannia Way are Residential Collection Road, with the extension of Britannia along the Phase 1 frontage to the cul-de-sac matching the asphalt of the existing right-of-way.'

a. Existing curb return and pedestrian letdown at west side of access to strata development at end of Britannia should be removed and replaced with sidewalk, to be extended to tie into the proposed multi-use path at end of Britannia Way. A driveway letdown should be installed at the entrance to the existing strata development on Britannia Way.

XVII. The SHATPMP states on page 4 that 'there is no explicit requirement for pedestrian or cycling connectivity in the OCP…' but does state on page 2, in part, that "the new greenways and trails will seamlessly connect both the road and trail network and create a linear corridor that will encourage low-carbon transportation choices…as a pedestrian or cyclist.

a. The report should reference the 2019 Connecting Courtenay Plan showing Royal Vista as a Neighborhood Bikeway.
b. The report should utilize the active transportation initiatives outlined in the December 20, 2021 TIA and subsequent memos for coordination of works that need to be constructed.
c. The report should include the City road Collector Road cross-section that are intended to be constructed and coordinated with the PIMP.
d. The Preliminary Infrastructure Master Plan (PIMP), Figure 4, shows an Alternative Collector Road Section – Residential with no cycling facilities, but with bulb-outs. The City's June 5, 2024 review letter to Crown Isle, comment 2.b.iii. asked that consideration be given to using cross-section CSSD CRD, which included dedicated cycling facilities. However, the only Collector cross-sections that Bylaw 2919 has with cycling lanes and 1.8m wide sidewalks is 'Collector Road Section Urban – B CSSD CUB' & the alternative solution cross-section 'Collector Road Section Urban – Entry CSSD CUE with a boulevard & streetlights down the centre of the road'. Neither CSSD CUB or CSSD CUE have bulb-outs. Please finalize the road cross-section you are proposing. WE need to arrive at a cross section that accommodates cycling as the current Figure 4 does not.

XVIII. Appended McElhanney Aug 14, 2024 Pg. 11 states "no indication Royal Vista Way would struggle". As previously stated the report should speak to the LOS is at intersection of Royal Vista Way terminus and Crown Isle Drive. The LOS may indicate the need for a dedicated East Bound Left turn lane. As this is a City asset this needs to be addressed.

Preliminary Infrastructure Master Plan (PIMP) dated January 22, 2025

XIX. Koers January 2025 Figure SS (Phasing plan) does not provide the distribution of units to total the zone density limit of 330 dwellings defined as 122 single dwelling units with secondary suites and 208 multi-family and duplex. Please revise the phasing plan to illustrate this.

XX. There are inconsistencies in dwelling units being used for capacity modeling over time that does not align with the zone. The total number of dwelling units for this zone is 330, this is to be used in capacity calculations. Please update to align with zoning.

XXI. Section 3.1 states '…. Royal Vista Way has been identified as a "Neighbourhood Bikeway" in the City's Cycling Network Plan…", this contradicts Pg. 4 of the SHATPMP stating no dedicated cycling. We suggest elimination of the separate street hierarchy/Active Transportation MP to eliminate the contradictions and have the road hierarchy/active transportation within the PIMP.

XXII. Figure 4 does not show cycle facilities in the Royal Vista cross section such as section CSSD CRB as previously noted.

XXIII. Section 4.1 - the Koers Figure WS – does not identify the number of MF dwelling Units in phase 4 and 5that have not been designed, highest and best use should be assumed for fire flow calculations and Geo-Advice should re-run the model for the noted possible 220 L/s at the expense of the applicant.

XXIV. Section 4.1 - connection to CVRD's Atlas Reservoir must be resolved between the City and CVRD with the applicant as this is needed for fire flows. This must be a condition of development, considering Table 2.8 of the GeoAdvice model indicates max fire flows are 156 L/s and PIMP indicates 220 may be needed.

XXV. Section 4.2 states that "the CVRD have indicated that the current 138m zone system is struggling to meet peak day demands' and 'CVRD staff plans to implement mitigation measures as soon as possible. It is not clear if these mitigation measures need to be constructed prior to further development within the 138, zone, but we understand that the CVRD is actively working to address this issue". Development in Lannan is dependant on this being resolved and needs to be identified what phase in the DA requires this infrastructure.

XXVI. Section 4.3 - It is acceptable that at detailed design it be determined if the applicant must either disconnect the looped domestic water flow through the existing strata, or install double check valves.

XXVII. Re: Sanitary servicing the development to the south through private property in CVRD.

A) Initial discussions with the CVRD indicate that the SRW is to be in favour of the City to operate and maintain. This legal agreement needs to be drafted and CVRD to state whether they wish to be a party to it. Further this legal document will specify that any realigned of this sanitary main is at the expense of the developer.

b) This proposed sanitary main runs through ESA which is under CVRD jurisdiction and an EDP is required for construction. This report needs to identify that this route is viable given the ESA.

The following concerns to be identified in the SRW:

i) Any connection to the main within the CVRD jurisdiction would be at the discretion of the City

ii) Any future development of the two properties in the CVRD which the sewer will travers will require approval by the City if they can or may impact the sewer, alignment and access

iii) Any relocation of the sewer line and SRW within the CVRD jurisdiction will be at the cost of others (i.e. not the City of Courtenay)

iv) A meter be installed on the sewer main prior to leaving the City boundary at the Lannan development to measure flows being conveyed into the CVRD jurisdiction

Preliminary Stormwater Management Master Plan (PSMMP) dated January 22, 2025

19. Author should provide an overall table showing the flows and storage volumes for each catchment area/facility and jurisdiction and highlighting which jurisdictions standard is being proposed and how that impacts the other jurisdictions, especially downstream. For instance, if the Britannia Way cul-de-sac were to release 10 L/s for the 100 year storm meeting the City standards, but not meeting the 4 L/s for the ACSS what does that mean for the downstream system and will Comox/MOTI support that?
20. For infrastructure related to this project that is in other jurisdictions the City will require design approval from those jurisdictions before final development approval.
21. The following comments from the City's June 5, 2024 review (Appendix C in the PIMP) letter are still applicable:
    i. Item 4.a.2, Section 3.11 – If you are design homes that will have basements /crawl spaces infrastructure to be designed to convey flows beyond the 10-year storm event. Covenants may required.
    ii. Item 4.a.3, Section 5.11 – That the stormwater that is flowing from Crown Isle through CVRD lands is on the private property located at 2205 Galleon Way and 1239 Anderton. We are suggesting that the blanket SRW for stormwater be extended to the lands at 1239 Anderton and 2205 Parry Place.
22. Item 6.1 – It is anticipated that the blanket SRW will have Crown Isle own and maintain stormwater management facilities on multi-family lots and private lands.
    i. Item 9, MOTI has indicated they want an SRW from Pond 20 over 1179 Parry Place to be formalized. Please provide the schedule to achieve resolution of this existing situation.

23. In comparing March 2024 report to January 2025 report there appears to be modifications to Catchment areas to Little River and Brooklyn Creek in Table 2 (page 4). Please provide design calculations for the proposed stormwater management pond in the format like Table 7 in appendix B of the January 2025 report. Please provide your input and output from your modelling.
24. Fig 2 - Note "Existing Drainage Course to be Re-graded and improved" - environmental approvals and possible compensation works need to discussed or recognized as the responsibility of the developer. As per Cascadia Biological there has been Coho salmon identified in the culverts and ditches which triggers requirements under Riparian Areas Protection Regulations (RAPR). This stormwater

plan needs to be coordinate with Environmental review as the proposed plan will need to consider this condition and will most likely need to be revised.

25. Page 5 Section 3 - When referencing City, Town and MOTI should also state that the most stringent or conservative of the 3 standards will met for all aspects of the design.
26. Section 3.1 - The stormwater management works within City jurisdiction must meet City standards as noted, however once stormwater exits from the City jurisdiction and prior to entering any municipally owned infrastructure it must meet the standards of the jurisdiction that the storm system resides in. In relation to volumes and flows and storage, as this impacts all 3 jurisdictions it must both meet the intent of all 3 jurisdictional requirements as well as the most stringent of all 3 including the ACSS document.
27. Section 3.2 fourth paragraph - remove the word endeavor, as per the letter from BCWS and municipal regulations the applicant and its agents will "meet or exceed" the standards, not endeavor to meet them.
28. Section 3.2 5th paragraph - the streamkeepers letter does not actually state that it supports the drainage system, just that it appreciates being engaged and defers to the regulators to ensure professional oversight.
29. Table 3 - Note (2) ".... required to determine the actual infiltration rate....." The applicant must either determined the infiltration rates at this time through a geotechnical investigation or provide assurance and alternatives should infiltration rates be inadequate to support infiltration. To manage risk to the City it is preferable a Geotech report be completed at this time.
30. Section 4.3 paragraph 4 - Related to previous comment regarding infiltration, please note the source of the soils classification and expand on what "moderate to low" infiltration properties will mean to the proposed development, especially in the context of the infiltration required by the ACSS.
31. Section 5.1.1 The SRW width for any stormwater conveyance shall be the greater of 9 meters or the edge of pipe/ditch +3 meters, for stormwater management facilities it shall be the top of or edge of the facility + 6 meters unless otherwise approved by City staff. (as per Section 1.4 of MMCD Guidelines 2022).
32. Section 5.2 Paragraph 2 - It should be noted the environmental requirements and function of the pond takes precedent over the golf course operation and property owners' input.
33. Table 8 assumes an infiltration rate of 10mm / hr, author needs to speak to options if that rate cannot be obtained. What are these options
34. Figure 5 - Onsite infiltration trenches can be effective when maintained, how will the City ensure the property owners maintain they're on site stormwater facilities and not simply let them overflow to the road if they become plugged or clogged? A covenant will be required for the lots. A lot grading plan will be required to identify locations ad provide a maintenance document.

35. Section 5.5.2 and 5.5.3 both speak to benefit of large downstream detention pond, please expand on what that benefit of this is.
36. Section 5.6, 6.4, 7.1.4 etc. - stating "This would appear to meet MOTI's requirements...." is not an acceptable statement, confirmation is required that they meet or exceed MOTI, Courtenay and Comox standards/ requirements.
37. Section 6.2 Detention pond. The applicant is aware of the recent spawning salmon in the adjacent ditches, this needs to be discussed with the province and mitigated.
38. Section 6.5 When designing infiltration, the key component is the capacity of the soils, without a Geotech report confirming actual infiltration rates the proposal could be "unrealistic or unattainable" how can the application be approved without assurances to avoid later development applications simply stating "geotechnical report indicates infiltration is not feasible therefore infiltration will not be provided".
39. Section 7.1.2, 7.1.3 Please clarify when considering the overlapping jurisdictions what storage will be provided for which storm/jurisdiction and total storage provided.
40. Item 9, MOTI has indicated they want an SRW from Pond 20 over 1179 Parry Place to be formalized. Please provide the schedule to achieve resolution of this existing situation.
41. In comparing March 2024 report to January 2025 report there appears to be modifications to Catchment areas to Little River and Brooklyn Creek in Table 2 (page 4). Please provide design calculations for the proposed stormwater management pond in the format like Table 7 in appendix B of the January 2025 report. Please provide your input and output from your modelling.
42. All culverts should be arch style – with a natural stream bottom to avoid creating perched culverts that inhibit fish passage

Parks Master Plan

43. **Grade:** Would like clarity on “gently graded developable park space” referenced in 3.0 – Parkland Dedication. What is the proposed grade?
44. **Parking:** Community park requires parking (as outlined in 3.1.1 of proposal) – need to show where this will be conceptually. They reference off-street, but there is no area designated for off-street so concerned they will try to use portion of park at future date
    a. Also – walking radius for community park is 800m, not 400m.
45. **Trail:**
    a. Eastern border is trail not linear park, not included in dedication calculation
    b. Southern trail is within park so can be counted (i.e. doesn’t have to be excluded from calculations)
    c. All trail construction needs to adhere to RAPR and OCP policies.
    d. There are no trail standards identified in PPMP or the PIMP or SHPMP, this needs to be included. These are the standards from the PRMP:

Accessibility: Universal accessibility where possible

Trail width: 1.5-3 metres

Clear width: 2-4 metres

Clear height: 2.4 metres

Corridor width: 7 metres minimum

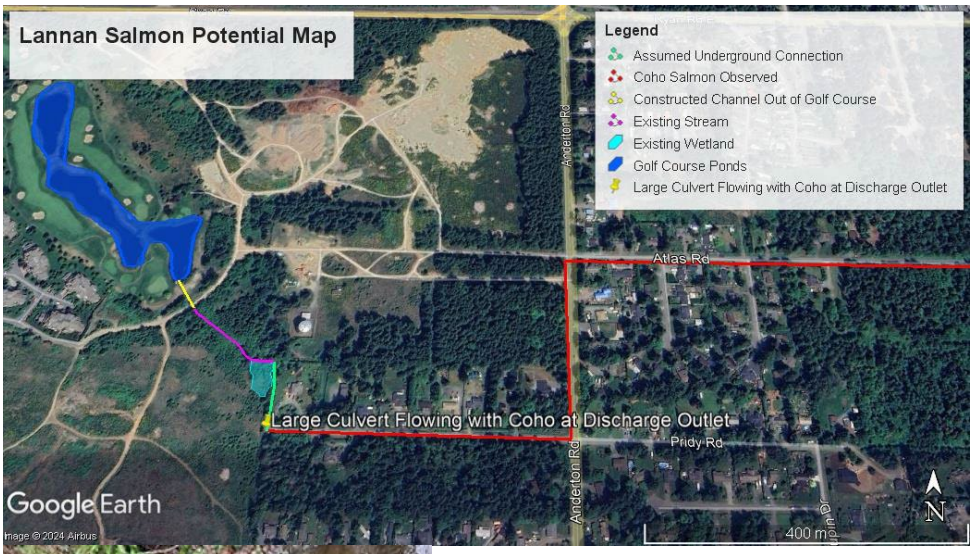
46. **Dedication** of Parkland Section 3.2
    a. A community park must be 1 ha as noted in MP.
    b. Table 1- 1.14 required parkland we believe .30 HA is low and may be .65ha and needs to be confirmed by City.
    c. What is the composition of the up 1.84 ha outside the tree retention area?
        i. Tree protection area is not park and a requirement from Council resolutions to be a section 219 covenant.
        ii. ESA can not be counted.
        iii. Trails outside the park should not be included in the parkland dedication calculation. Only trails within the park.
47. The residents accessing this park would benefit from a playground installation there are no playgrounds within an 800 m/10 M walk.
48. The park playground design standards recommend the following for pathways:
    a. Primary pathways 3 m wide
    b. Secondary pathways 3m wide
    c. Primary and secondary pathways, longitudinal slopes should be maximum 5% and cross slopes maximum 2%.
49. OCP policies listed page 4 and 5 do not indicate how the policies are being met and also states “may” be met and why its “may”. This needs to be addressed.
50. Identify, proposed Community, neighbourhood parks or smaller parks on the proposed plan to show how development will be serviced by parks .

Overview Environmental Assessment Review Plan

Site 1

The proposed stormwater settling pond(s) along the northeastern corner of the property noted above does not currently consider recent fisheries observations made by Cascadia Biological Services (Thomas Roy) in December 2024 and passed along to applicant on February 11, 2025. During that time, spawning Coho salmon were observed in the shallow ditch running along Lannan Road see photo below.

The fish at the end of Lannan were documented travelling through an 800mm CSP culvert into the wetland complex along the northeastern corner of the property as well as into the rock riprap immediately south of the ponds on the golf course see above overview map and below potential Salmon map for Lannan. The presence of fish at this location defaults the proposed stormwater pond wetland area and adjacent creek as waterbodies under the Riparian Areas Protection Regulations (RAPR) legislation. Flows from this area eventually make their way into the Little River. The Master Plan needs to address this condition and utilize the RAPR to inform infrastructure design in the MP for both PIMP and PSMMP. Their may also be impacts on the PPMP on park areas.



Site 2 (Overview Plan above)

This area is proposed to have the removal of an isolated wetland with a replacement identified as a stormwater pond downstream of this location. The City of Courtney generally does not allow for a wetland to be removed from what is considered an environmentally significant area. If the proposal is to consider removing said wetland and this support by the province, a replacement value needs to be considered i.e. 3:1 and this scenario needs to be incorporated into the plan. Stormwater ponds are not to act as replacements for a natural state wetland. The presence of this was not identified in earlier inventories and the Council Reports indicated this needed to be done and incorporated into a PDA/DA.

Site 3 (Overview Plan Above)

Consist of the classification of forestry remnants along the southwestern corner of the property as non sensitive. Although not meeting BC Conservation Data Centre blue/red listed biogeoclimactic site series classifications, the forest at this location is considered sensitive eco inventory (SEI) – this area best meets best described as older second-generation forest habitat. The protection of this SEI is a concern of Council and has ben referred in previous Council reports.

Site 4 (Overview Plan Above)

Site 4 is an overview location of a trail system that is being proposed within designated RAPR stream and SPEA's flowing south out of the property to the south. Confirmation is needed if the proposed trails follow historic trail locations or are they being proposed as new trails. Clarification is needed on how they would be permitted under the RAPR legislation if the build is considered new. This impacts the Parks Master Plan.

APPENDIX F

Summary tables of volumes and peak flows for each storage facility and how they address the requirements of each regulatory jurisdiction

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Consulting Engineers

Brooklyn Creek Catchment

Project Peak Flows and Storage Volumes Compared to City of Courtenay and MoTT Design Standards

Project Flows Compared to City Critieria

Description	2 year			5 year			10 year			25 year			100 year		
	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change
	Peak Discharges, L/s														
MF 1	11	8	-3	19	10	-9	25	11	-14	41	15	-26	66	32	-34
Brittania Way CDS	3	2.0	-1	6	2.5	-3.5	8	3.3	-4.7	13	4	-9	20	10.0	-10
MF 2	16	15	-1	28	21	-7	36	34	-2	58	48	-10	93	90	-3
MF 3	21	20	-1	36	26	-10	47	38	-9	75	58	-17	121	106	-15
"The Park" Detention Pond	73	68	-5	115	109	-6	143	137	-6	223	197	-26	347	294	-53

Notes: A negative "change" indicates post development peak flows are less than pre-development.
Peak Flows from the site using City of Courtenay IDF Curves and Storm Distributions and Compared to City of Courtenay Bylaw 2919

For all modeled scenarios, the proposed storm drainage management system exceeds City criteria, as the post-development flows are less than the pre-development flows.

Project Flows Compared to MoTT Critieria

Description	5 year			100 year		
	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change
	Peak Discharges, L/s					
MF 1	19	10	-9	66	32	-34
Brittania Way CDS	6	2.5	-3.5	20	10	-10
MF 2	N/A - MF 2 is tributary to "The Park" Detention Pond Catchment					
MF 3	N/A - MF 3 is tribuutary to "The Park" Detention Pond Catchment					
"The Park" Detention Pond	115	109	-6	347	294	-53

Notes: A negative "change" indicates post development peak flows are less than pre-development.
Peak Flows from the site using City of Courtenay IDF Curves and Storm Distributions and Compared to City of Courtenay Bylaw 2919

For all modeled scenarios, the proposed storm drainage management system exceeds MoTT criteria, as the post-development flows are less than the pre-development flows.

Project Volumes Compared to City & MoTT Critieria

Description	Catchment Area (Ha)	Required Peak Storage Volumes										Proposed Storage Capacity (m3)	Surplus 100 year Storage (m3)
		2 year		5 year		10 year		25 year		100 year			
		Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)		
MF 1	0.83	181	218	289	348	366	441	433	522	487	587	**790**	303
Brittania Way CDS	0.25	45	180	85	340	100	400	125	500	135	540	**260**	125
MF 2	1.41	300	213	460	326	510	362	570	404	610	433	**660**	50
MF 3	1.78	360	202	560	315	660	371	740	416	790	444	**800**	10
"The Park" Detention Pond	10.78	1320	122	2660	247	3030	281	3460	321	3990	370	**6400**	2410

Note: Actual Peak Storage Volumes and Proposed Storage Capacity are subject to refinement during detailed design.
City and MoTT use similar criteria to determine discharge rates and storage volumes.

For all modeled scenarios, the proposed storm drainage volumes exceeds both City and MoTT criteria, as the proposed pond volumes exceed the required pond volumes

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Consulting Engineers

Brooklyn Creek Catchment

Peak Flows and Storage Volumes Compared to the Anderton Corridor Servicing Study (ACSS) Design Targets (Town of Comox Criteria)

Description	100 year Discharge Targets			100 year Storage Targets		
	Peak Unit Flow (L/s/ha)	Catchment Area (Ha)	Peak Target Flow (L/s)	Target Unit Volume	Developed Area	Target Volume
MF 1	16.1	0.83	13	475	0.83	394
Brittania Way CDS	16.1	0.25	4.0	475	0.25	119
MF 2	n/a - MF 2 is within "The Park" Detention Pond catchment					
MF 3	n/a - MF 3 is within "The Park" Detention Pond catchment					
"The Park" Detention Pond	16.1	10.78	174	475	6.69	3178

Proposed Design Flows and Volumes			
Pond Full Capacity (m3)	Pond Depth at Target Discharge (m)	Storage Volume at Target Discharge (m3)	Surplus Volume above target (m3)
790	0.72	400	6
260	0.70	125	6
n/a - MF 2 is within "The Park" Detention Pond catchment			
n/a - MF 3 is within "The Park" Detention Pond catchment			
6700	0.86	3295	117

Note: a positive "Surplus Volume" indicates there is more storage volume than required

For all modeled scenarios, the proposed storm drainage volumes exceeds Town of Comox criteria, as the proposed pond volumes exceed the required pond volumes

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Consulting Engineers

Little River Catchment

Project Peak Flows and Storage Volumes Compared to City of Courtenay and MoTT Design Standards

Project Flows Compared to City Critieria

Description	2 year			5 year			10 year			25 year			100 year		
	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change
Peak Discharges, L/s															
MF 4	12	12	0	21	16	-5	27	25	-2	43	38	-5	69	58	-11
MF 5	13	13.0	0	22	16	-6	28	27	-1	45	41	-4	72	63.0	-9
Lannan Road Detention Pond	224	163	-61	329	212	-117	401	261	-140	487	308	-179	587	585	-2

Notes: A negative "change" indicates post development peak flows are less than pre-development.
Peak Flows from the site using City of Courtenay IDF Curves and Storm Distributions and Compared to City of Courtenay Bylaw 2919

For all modeled scenarios, the proposed storm drainage management system exceeds City criteria, as the post-development flows are less than the pre-development flows.

Project Flows Compared to MoTT Critieria

Description	5 year			100 year		
	Pre Dev	Post Dev	Change	Pre Dev	Post Dev	Change
Peak Discharges, L/s						
MF 4	N/A - MF 4 is within Lann Road Detention Pond Catchment					
MF 5	N/A - MF 5 is within Lann Road Detention Pond Catchment					
Lannan Road Detention Pond	329	212	-117	587	585	-2

Notes: A negative "change" indicates post development peak flows are less than pre-development.
Peak Flows from the site using City of Courtenay IDF Curves and Storm Distributions and Compared to City of Courtenay Bylaw 2919

For all modeled scenarios, the proposed storm drainage management system exceeds MoTT criteria, as the post-development flows are less than the pre-development flows.

Project Volumes Compared to City & MoTT Critieria

Description	Catchment Area (Ha)	Required Peak Storage Volumes										Proposed Storage Capacity (m3)	Surplus 100 year Storage (m3)
		2 year		5 year		10 year		25 year		100 year			
		Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)	Storage Volume (m3)	Unit Volume (m3/ha)		
MF 4	1.05	230	219	345	329	395	376	430	410	490	467	600	110
MF 5	1.13	250	221	380	336	425	376	465	412	525	465	600	75
Lannan Road Detention Pond	50.3	1720	173	2110	212	2350	236	2720	273	6470	650	7800	1330
Developed Catchment	9.95												

Note: Actual Peak Storage Volumes and Proposed Storage Capacity are subject to refinement during detailed design.
City and MoTT use similar criteria to determine discharge rates and storage volumes.

For all modeled scenarios, the proposed storm drainage volumes exceeds both City and MoTT criteria, as the proposed pond volumes exceed the required pond volumes