# AGENDA
# Community Planning Advisory Committee

**Wednesday, February 2, 2022 at 7:00 p.m.**
**This meeting will be held electronically**

***Mandate*: The mandate of the committee is to provide feedback to applicants and advice to Council on land use applications, policies, regulations and initiatives referred either directly by Council or through the Development Approval Procedures Bylaw.**

1. **CALL TO ORDER AND ACKNOWLEDGEMENT (7:00pm)**
   **The Town of Ladysmith acknowledges with gratitude that this meeting takes place on the traditional, unceded territory of the Stz'uminus First Nation.**

1.1 **INFORMATION ON HOW TO VIEW/ATTEND THE MEETING**

Residents are encouraged to "virtually" attend the meeting using the meeting link below:
https://zoom.us/j/97678151102?pwd=QW13RUxEdldaem5kRUkzam81SXc1dz09

For those unable to attend by electronic means, the meeting will be broadcast in the City Hall Council Chambers at 410 Esplanade. Masks are mandatory and seating is limited.

2. **AGENDA APPROVAL (7:00pm)**

3. **ADOPTION OF DECEMBER 1, 2021 MINUTES* (7:05pm)**

4. **NEW BUSINESS**

5. **COUNCIL REFERRALS (7:10pm)**
   a. **Official Community Plan & Zoning Bylaw amendment application 3360-21-08* Holland Heights/Arbutus Hump**
   **(30 minutes)**

6. **MONTHLY BRIEFING (7:40pm)**
   **File Updates**

7. **NEXT MEETING - TBD**

8. **ADJOURNMENT (7:45pm)**

***Attachments**

# MINUTES
# Community Planning Advisory Committee
**Wednesday, December 1, 2021 at 7:00 p.m.**
**Via Zoom**

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**PRESENT:** Chair – Jason Harrison; Members – Abbas Farahbakhsh, Brian Childs, Jason Robertson, Jennifer Sibbald, Steve Frankel, Tamara Hutchinson; Council Liaison – Tricia McKay; Director of Development Services, Jake Belobaba; Senior Planner & Recorder – Christina Hovey;

**ABSENT:** None.

**GUESTS:** Applicant – Matt Schnurch (3360-20-06)
Applicant – David Stalker (3360-21-09)
Applicant – Aaron Hungar (3360-21-11)

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**The meeting was called to order at 7:05pm, acknowledging with gratitude that Ladysmith is located on the traditional unceded territories of the Stz'uminus First Nation.**

**1. AGENDA APPROVAL**
**It was moved, seconded and carried that the Agenda of December 1, 2021 be approved.**

**2. ADOPTION OF MINUTES**
**It was moved, seconded and carried that the Minutes of October 6, 2021 be approved.**

**3. COUNCIL REFERRALS**

a. **OCP & Zoning Bylaw Amendment application 3360-20-06**
**10940 Westdowne Road (Town & Country Mobile Home Park)**

Staff provided a brief introduction to the application. Matt Schnurch (the applicant) stated that in the short term the property is proposed to be used as an office and the existing single-family home. It is expected that four new mobile home pads could be accommodated on the property in the future. Staff confirmed that, based on background information available, it is not advisable to add any new development to the existing septic system of the Town and Country Mobile Home Park.

One committee member suggested that the existing water service (provided by the CVRD) might not be adequate to provide fire protection to the property. Staff committed to look into the concern.

**It was moved, seconded and carried that the Community Planning Advisory Committee recommends that Council approve OCP and Zoning Amendment application 3360-20-06 (10940 Westdowne Road) with an expectation that:**

- **A covenant will be placed on the property preventing expansion of the mobile home park pending a connection of the property to sewer services.**
- **Staff will review the adequacy of the water service for fire protection.**

**b. <u>OCP & Zoning Bylaw Amendment application 3360-21-09</u>**
**<u>1134 Trans-Canada Highway</u>**

Staff provided a brief introduction to the application. Staff corrected one point from the referral report to clarify that the Ministry of Transportation and Infrastructure (MoTI) had agreed to a right-out-only access driveway in the context of a previous application. The referral report incorrectly stated that MoTI would not support any access to the highway from the property.

David Stalker (the applicant) provided information about the scale of the proposed operations, the company currently needs office space for six employees, clients visit the office occasionally, and core office hours are between 7am and 5pm.

The committee discussed a need for high quality landscaping for the site (to be reviewed through the development permit application). There are some existing trees in one area of the property and an existing fence along the highway.

**It was moved, seconded and carried that the Community Planning Advisory Committee recommends that Council approve OCP & Zoning Amendment application 3360-21-09 (1134 Trans-Canada Highway) and that landscaping and screening be considered along the Trans-Canada Highway.**

**c. <u>Zoning Bylaw Amendment application 3360-21-11</u>**
**<u>631 1st Avenue (Winter Shelter)</u>**

Staff provided a brief introduction to the application and explained the restrictions placed on the shelter through the existing Temporary Use Permit (the shelter can only operate overnight and only during the winter months). Staff corrected one point from the referral report to clarify that the shelter is proposing to expand into one dwelling unit rather than two units.

Aaron Hungar (on behalf of the applicant) provided information about emerging challenges with the current temporary location of the shelter at the Islander Hotel and answered questions from the Committee about proposed operations and security.

CPAC indicated that they "wholeheartedly" support this proposal.

**It was moved, seconded and carried that the Community Planning Advisory Committee recommends that Council approve Zoning Bylaw Amendment application 3360-21-11 (631 1st Avenue).**

**4. NEW BUSINESS**

None.

**5. MONTHLY BRIEFING**

**File Updates:**

The application for 431 1st Avenue (File No. 3360-21-10) that was previously reviewed by CPAC has received 1st, 2nd, and 3rd reading from Council and the Public Hearing has

been held. CPAC members are invited to review the Council Agendas and Minutes or contact staff for further details.

**Council Liaison:**

On November 30, 2021 Council appointed Councillor Marsh Stevens to act as the Council liaison to CPAC for 2022, Councillor Tricia McKay was appointed as the alternate.

CPAC members thanked Councillor McKay for her support and hard work, and in particular thanked her for her advocacy in ensuring the group is heard by Council.

**6. NEXT MEETING – February 2, 2022.**

**7. ADJOURNMENT**

**It was moved, seconded and carried that the meeting be adjourned at 8:33pm.**

_____

Chair (J. Harrison)

**RECEIVED:**

_____

Corporate Officer (D. Smith)

# REFERRAL REPORT

**Report Prepared By**: Jake Belobaba, Director of Development Services
**Meeting Date:** February 2, 2022
**File No:** **3360-21-08**
**Re:** **Rezoning and OCP Amendment Application: Lot 5 Holland Creek**

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## EXECUTIVE SUMMARY:

The Town has received an application for an official community plan and zoning bylaw amendment for "Lot 5" in the northwestern corner of the Holland Creek Development. The conceptual plan for the 17ha site is for a mix of stratified and fee simple single family dwellings, townhouses, and park.

This file has been referred to CPAC for comments in accordance with CPAC's Terms of Reference. The CPAC Terms of Reference provides the following guidance for reviewing OCP and Zoning Bylaw Applications:

- Refer to the Official Community Plan and Council's strategic priorities in the review of the proposal;
- Hear from the applicant and its consulting team through a brief presentation;
- Consider each proposal on its own merits.

## INTRODUCTION/BACKGROUND:

### Property/Context

The subject property is 17 ha in size and located in the northwestern corner of the Holland Creek Development. The property is vacant and partially logged. The southern half of the property is steeply sloped, and the northern half is flatter/undulating. The property is bounded on the north and west sides by Holland Creek Park and on the south and east sides by two vacant/partially developed parcels that also make up the Holland Creek Development.

### Existing OCP & Zoning

The property is currently designated 'single-family residential', 'estate single-family residential' and 'park and open space' under Schedule C (Holland Creek Area Plan) of the OCP. It is currently zoned Single Dwelling Residential (R-1) under the Zoning Bylaw. The southern portion of the site is covered by the Arbutus Hump ESA Development permit area. The applicant is proposing a road connection to the lot to the east that is farther south than called for in the Holland Creek Area Plan.

The site is currently zoned Single Dwelling Residential (R-1) which allows single-family dwellings but not Townhouses.

*Figure 1: Subject Property*


**Natural Environment:**

The applicant submitted an Environmental Assessment (Attachment B). Much of the site is located in the Douglas-fir / Arbutus ecosystem, which is a red-listed ecosystem. Much of this area, will be dedicated as park under the proposed development. No red listed species or critical habitat was identified on the property. The report outlines a number of protective features (such as invasive plant control) to protect the sensitive ecosystem. A wildfire assessment has also been complete and is attached as Attachment C.

**Proposed Development:**

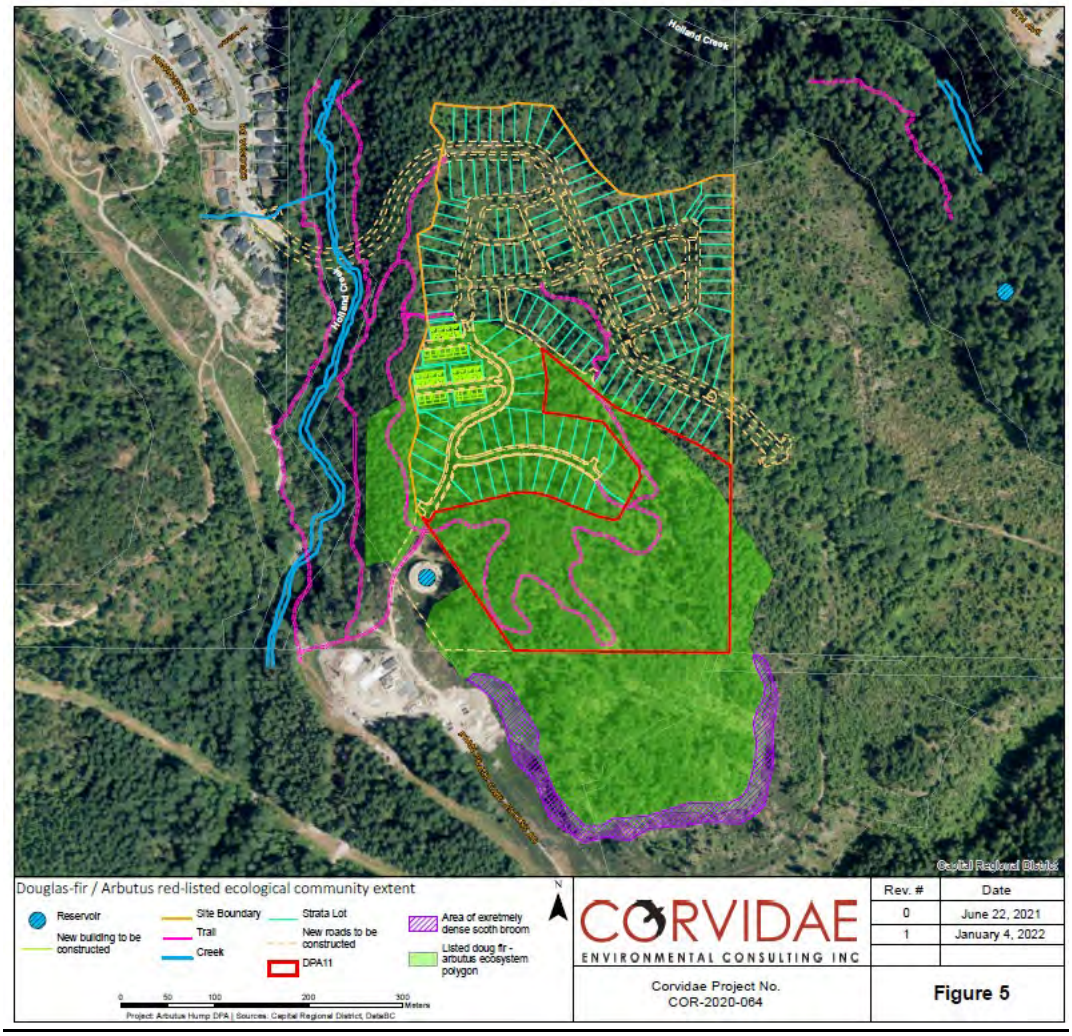
The applicant is requesting site specific zoning to accommodate the concept plan (Attachment A) for the property. The proposed plan shows a mix of townhomes, and single family homes as follows:

- 110 Single-Family Homes(fee simple)
- 32 Single-Family Homes (strata)
- 26 Townhomes (strata)

Policy 7.2.10 of the Holland Creek Area Plan, requires the multi-family areas to be designated as a multi-unit development permit area for form and character, sustainability and climate action features. The proposal also includes 5.1 ha of park (30% of the parcel) which includes the summit of Arbutus Hump. The approximate density of the development will be 10 units per hectare. The proposal requires an amendment to the zoning bylaw and an amendment to the Official Community Plan.

*Figure 2: Holland Creek Area Plan, Schedule C*

*Figure 3: Proposed Development in Relation to Douglas Fir/Arbutus Ecosystem*




## DISCUSSION:

The proposal generally aligns with the land use designations and road layouts outlined in the Holland Creek Area Plan, which forms part of the OCP. The proposal is consistent with policy 4.2.2, to provide a mix of housing sizes and types and policy 7.1.3 which encourages multi-family units to be "ground-oriented" (e.g. Townhouses).

The proposal is consistent with policies 4.2.4, 4.2.5 and 4.2.10 which call for minimizing the impact of hillside development, creating interconnected greenspace and protecting Arbutus Hump. Similarly, the proposal is relatively consistent with section 5.1 of the Holland Creek Area Plan, which calls for the preservation of natural/environmentally sensitive areas (including Arbutus Hump). The proposed development does encroach into the Douglas Fir/Arbutus ecosystem in the area designated as estate residential. This area of the Douglas Fir/Arbutus ecosystem was unmapped when the Holland Creek Area Plan

was adopted. The proposal includes both “natural” and “active” parks, consistent with policy 5.2.10 of the Holland Creek Area Plan. The Wildfire Assessment and Environmental Assessment include safeguards to protect the site from wildfire and prevent the proliferation of invasive plants into sensitive ecosystems.

**ATTACHMENTS:**

A. Concept Plan
B. Environmental Assessment
C. Wildfire Assessment
D. Preliminary Geotechnical Report


# HOLLAND HEIGHTS | Design Summary

Resubmission | November 2021

EKISTICS

# CONTENTS

# Section 1 | **PROJECT CONTEXT + ANALYSIS**

# PROJECT CONTEXT

- The Holland Heights Neighbourhood Concept aims to realize the vision of the Holland Creek Local Area Plan, through the development of the northern portion of the lands with a walkable neighbourhood serving to connect North and South Ladysmith.
- The Concept follows the land use established in the Holland Creek Local Area Plan with a collection of ~168 homes, in both Single-Family and Townhouse format. The proposed density is less than the projected 200 units.
- The Neighbourhood proposes a pedestrian and cycling focused network of public and strata streets, natural trails, and parks.
- The Neighbourhood observes the environmental setbacks from Holland Creek and protects the Arbutus Hump through:
  - Park Dedication;
  - Invasive Weed Management Plan;
  - New recreation access + trails;
  - 219 landscape covenants on adjacent private properties;
  - Enhanced connections with the larger Holland Creek recreation network.

# STRATEGIC POSITION

Owning to the land's scale, prominent setting, and strategic position within the Town of Ladysmith, the design for the Holland Heights Neighbourhood represents an opportunity for a new neighbourhood to realize the community's vision for long-term growth.

- The Holland Heights Neighbourhood is situated south of Holland Creek and the Holland Creek trail system, ~1 kilometre southwest from the Downtown and Island Highway.
- The north connection to the Neighbourhood includes a new bridge crossing over Holland Creek to connect Colonia Drive with Dogwood, serving to create a new connection between North and South Ladysmith.
- Despite its greenfield nature, the neighbourhood is within a 5 minute walk (400 metres) of amenities including, Firehall + EMS as well as Ladysmith Secondary and Primary Schools.

# A NEW CONNECTION

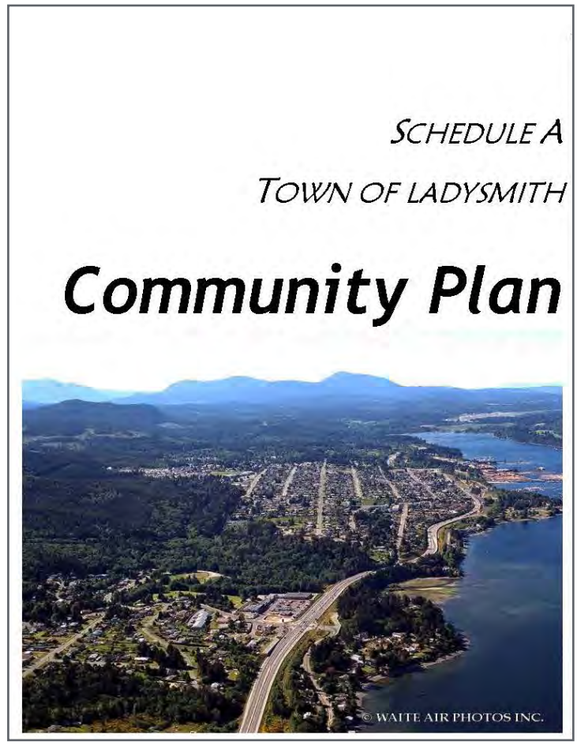
Following the Area Plan, the proposed extension of Colonia Drive to Dogwood is critical to providing the required municipal roads and services to the designated growth area. Lamont Land has begun the process of completing this connection with the approval and construction of the Holland Creek Bridge Crossing.

Extending from the Holland Creek Crossing, the Neighbourhood incorporates the required Urban Collector serving to connect the future Neighbourhood with the surrounding community. The Collector will reduce traffic demand on Dogwood Drive and serve as a new cycling, pedestrian, and vehicle connection between north and south Ladysmith, completing the vision established in the Official Community Plan and Holland Creek Local Area Plan.

# POLICY CONTEXT

Holland Heights complies with the Township's guiding policies through the creation of a new walkable neighbourhood serving to connect North and South Ladysmith as part of Ladysmiths long term growth vision.

The Concept also protects the natural and cultural importance of local ecological features by avoiding development within proximity to Holland Creek and the Arbutus Hump.




## OFFICIAL COMMUNITY PLAN VISION (2018)

The Official Community Plan ('OCP') calls for:

- "...a community that maintains a small town feeling, manages growth, welcomes new people and builds community spirit and involvement. Community spirit is demonstrated through participation at community celebrations, care for our neighbourhoods, and respect for our heritage. Our community is warm and inviting."
- "...a complete community that balances the need for economic growth with environmental and climate protection, ensuring a diversity of housing and transportation choice, while maintaining and developing the necessary support facilities. Ladysmith supports cultural and environmental stewardship through partnerships that fosters community ownership. Economic benefits are derived from planned, sustainable growth and development."

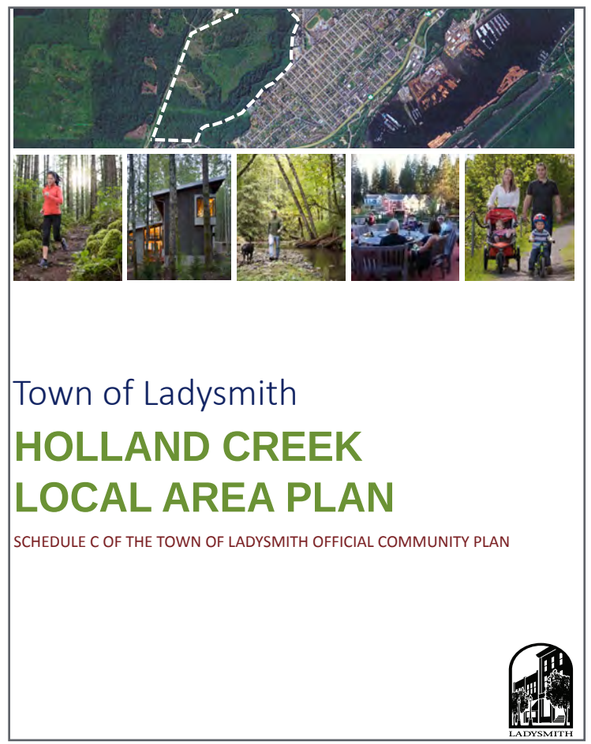
The OCP also identifies that the Holland Creek Neighbourhood will be the site of a new major residential neighbourhood area capable of accommodating 2,000 to 3,000 people and guided by the Holland Creek Local Area Plan.

## HOLLAND CREEK LOCAL AREA PLAN – SCHEDULE C OF BYLAW 1488 VISION (2016)

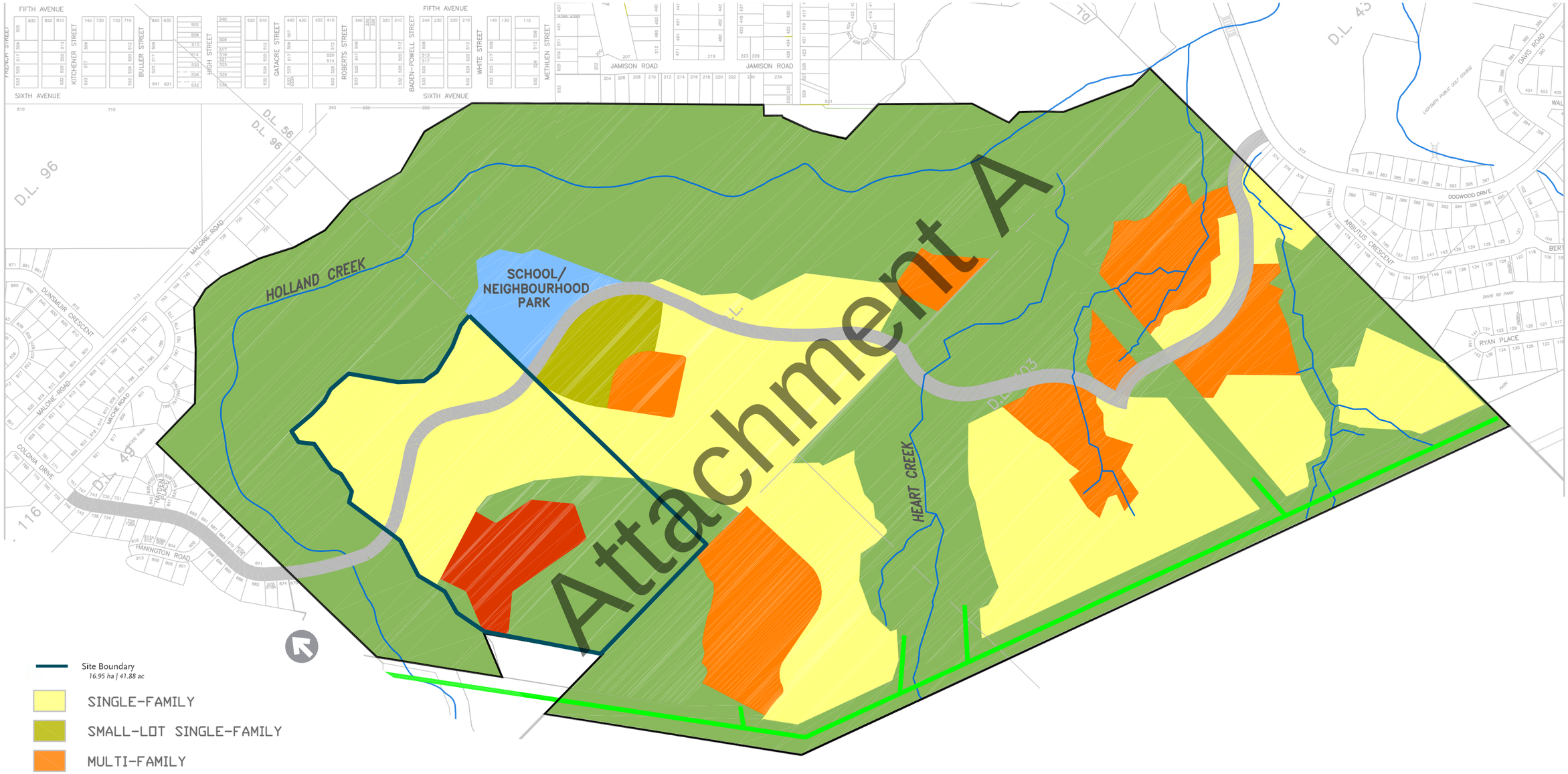
The Holland Creek Local Area Plan emphasizes several planning and design principles to encourage the development of a new residential neighbourhood. This includes:

- Accommodating 2,000 to 3,000 residents (approximately 1090 units) over the next 20 to 30 years;
- Providing a model in terms of responsible, sustainable and attractive development that other areas can emulate;
- Incorporating a mix of densities and dwelling types;
- Accommodating aging in place;
- Developing and incorporating parks and open space;
- Reducing the visual impact of hillside development;
- Creating a connected green space network and habitat friendly landscapes; and
- Protecting the top of Arbutus Hump, encouraging recreational uses, and limiting development.

With a projected density of 200 units, the Holland Heights Neighbourhood proposes 168 Single-Family Homes and Townhomes.



# HOLLAND CREEK LOCAL AREA PLAN | MAP 3 - LAND USE (2016)



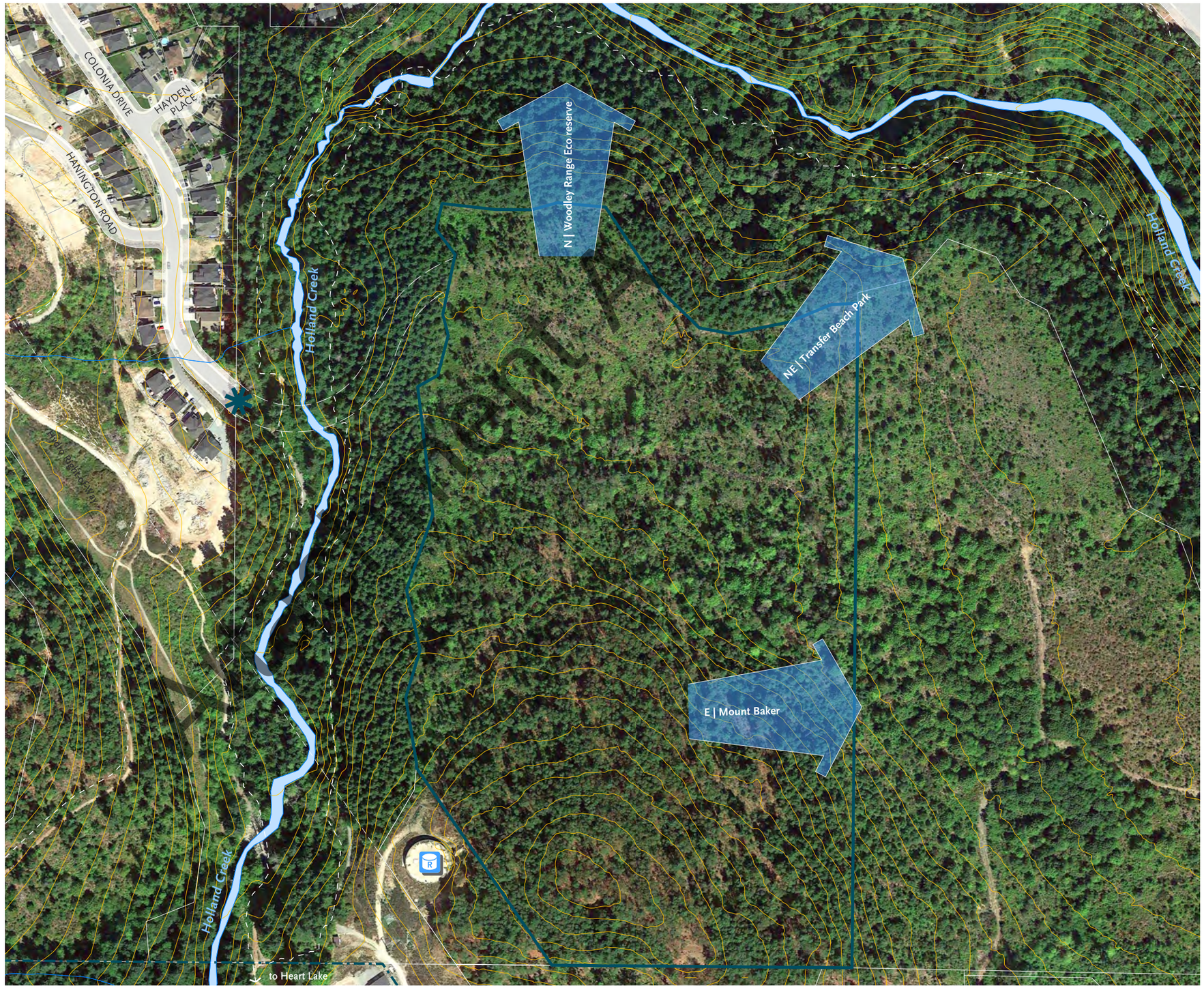
# UNDERSTANDING THE LAND

## GUIDED BY TOPOGRAPHY

- The 41.88 acre (16.95 ha) site is situated south of Holland Creek and trail system, ~1km southwest of the Downtown and Island Highway.
- Holland Creek functions as a natural boundary for the site on the north, east, and west.
- With its dramatic hillside setting, the site offers panoramic views towards the Woodley Range Ecological Reserve, Northern Gulf Islands, Thetis Island, North Shore Mountains, Southern Gulf islands, and Mount Baker.
- The southern portion of the site includes a community landmark - The Arbutus Hump.
- Perched above downtown Ladysmith, the lands were cleared through past logging, with the exception of the Arbutus Hump.

## PREVIOUSLY CLEARED

- The lands have historically been privately managed forest and were extensively logged.
- Parcels south of the site are cleared and bisected by a BC hydro corridor as well as the Township's water reservoir + infrastructure.



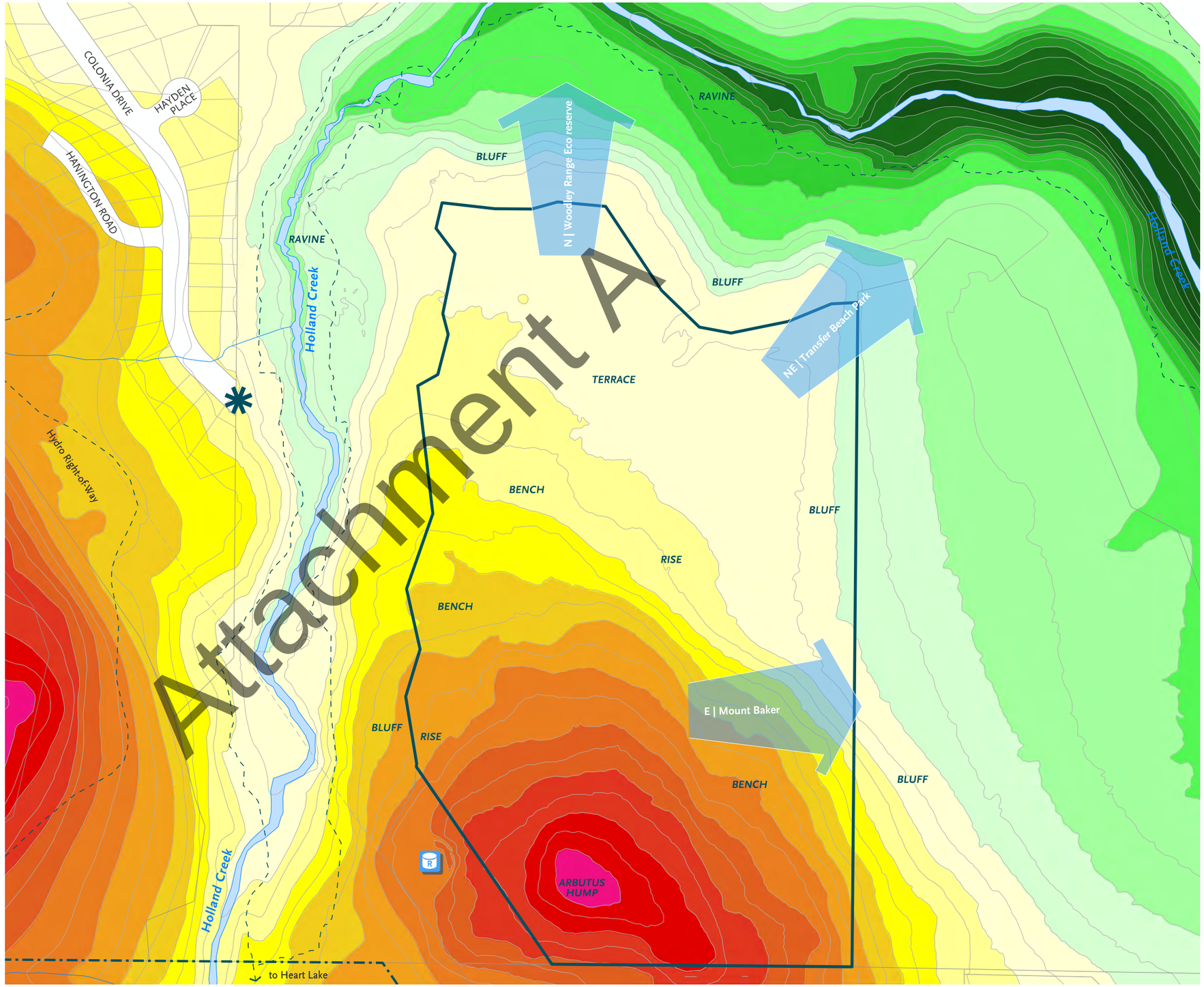

Site Boundary
*16.95 ha | 41.88 ac*
Legal Property Lines
Legal Right-of-Way
Future Access Road ROW

5m Contour Interval
Watercourse
Existing Trail Network
Reservoir
Current Site Access Point
Significant Views

# LANDFORM ANALYSIS

## DISTINCTIVE LANDFORMS

- The site is topographically distinct with 3 defined landforms - a terrace to the north, framed gentle hillside slopes and the steep bluffs of the Arbutus Hump to the south.
- These distinctive landforms structure the site's natural character and provide opportunity to leverage the lands features.






Site Boundary
*16.95 ha | 41.88 ac*
Legal Property Lines
Future Access Road ROW
5m Contour Interval
Watercourse
Existing Trail Network
Reservoir
Current Site Access Point
Significant Views

SLOPE ANALYSIS

Site Elevation
- 210m - 220m
- 200m - 210m
- 190m - 200m
- 180m - 190m
- 170m - 180m
- 160m - 170m
- 150m - 160m
- 140m - 150m
- 130m - 140m
- 120m - 130m
- 110m - 120m
- 100m - 110m
- 90m - 100m
- 80m - 90m
- 70m - 80m
- 60m - 70m
- 50m - 60m
- 40m - 50m
- 30m - 40m
- 20m - 30m
- 10m - 20m
- 0m - 10m

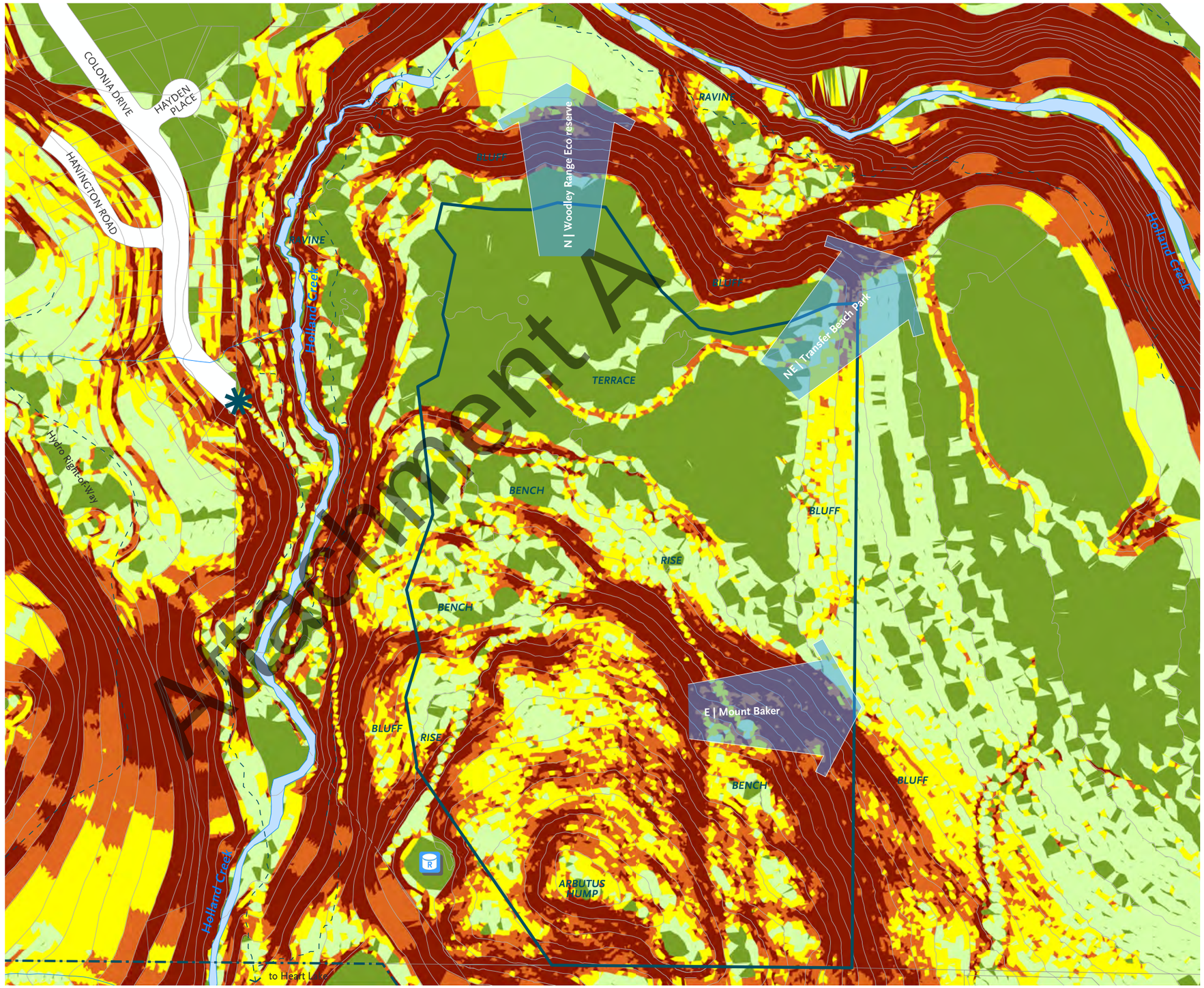
# SLOPE ANALYSIS

## FORESTED BACKDROP

- Despite its perched position overlooking Holland Creek ravine, the land is bordered by a mature stand of retained forest within the adjacent riparian setback, establishing a secluded setting.
- The land features a generous northern terrace, with adjacent hillsides interlaced with smaller benches which provide unique enclaves suitable for neighbourhood clusters.
- The terrain complexity serves to visually absorb new homes into the hillsides and creates opportunities for new trails and protected natural areas.

## UNLIMITED VIEWS

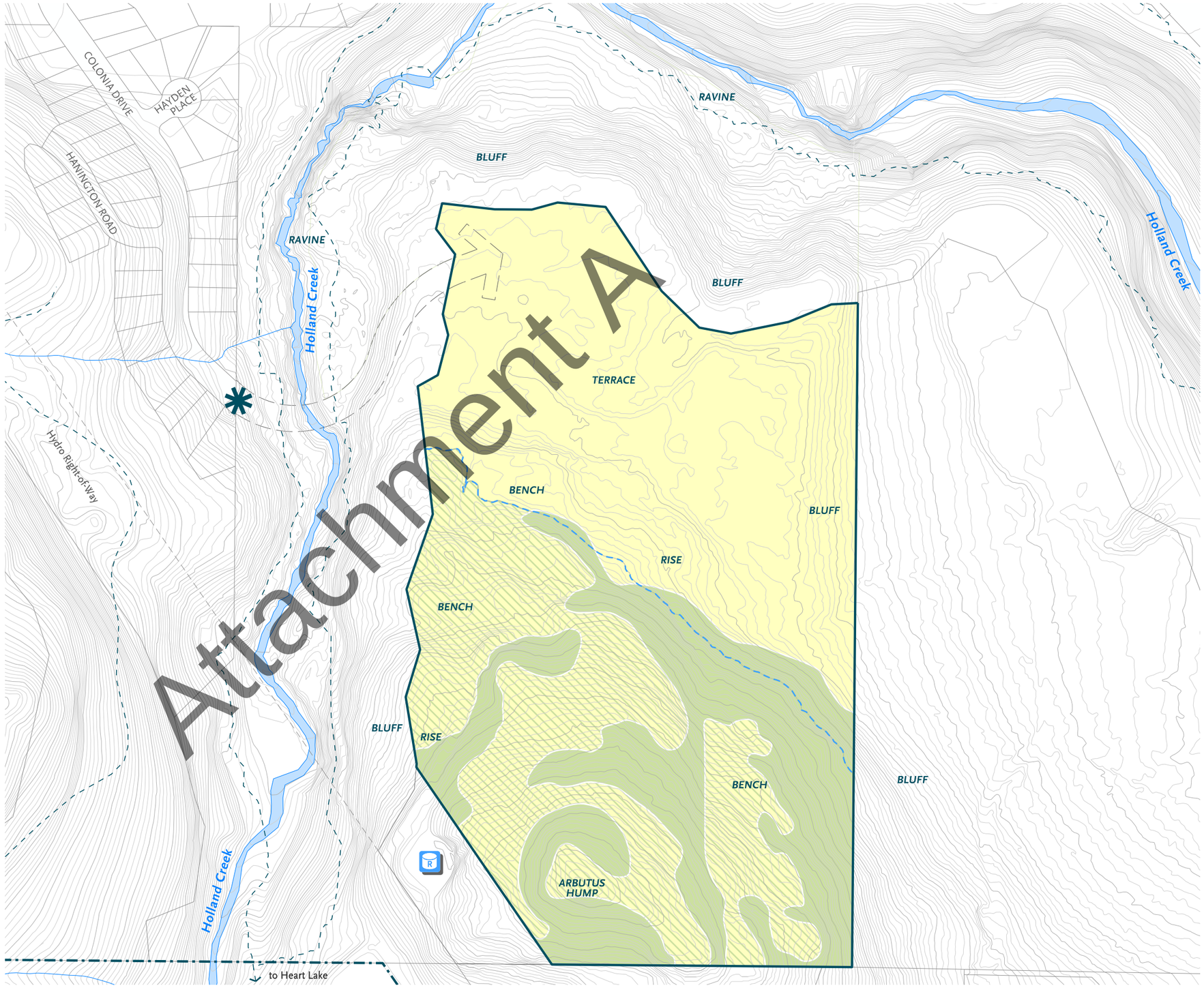
- The site enjoys views to the north, east, and west offering stunning vistas towards the Woodley Range Ecological Reserve, Northern Gulf Islands, Thetis Island, North Shore Mountains, Southern Gulf Islands, and Mount Baker.



# DEVELOPMENT POTENTIAL

## A NEW NEIGHBOURHOOD

- Considering the site's topography, natural setting, and scenic perch above Holland Creek, the site provides a rich opportunity for the development of a new walkable neighbourhood, leveraging the lands views, natural character and surrounding recreation network.
- The Development Potential analysis reflects the land's natural qualities, environmental constraints, and existing infrastructure, with the following results:
    - 46% of the land as Developable - potential for central public neighbourhood;
    - 28% of the land as Constrained - potential for clustered strata homes, and;
    - 26% of the land as Non-Developable - potential for protected natural areas and parks.






DEVELOPMENT POTENTIAL ANALYSIS

| | | |
|---|---|---|
| 46% | Developable | 7.73 ha \| 19.10 ac |
| 28% | Constrainted | 4.86 ha \| 12.01 ac |
| 26% | Non-Developable | 4.36 ha \| 10.78 ac |
| 100% | TOTAL | 16.95 ha \| 41.88 ac |

# Section 2 | **HOLLAND HEIGHTS CONCEPT**

# HOLLAND HEIGHTS NEIGHBOURHOOD CONCEPT

## TOWARDS SUSTAINABILITY

The Holland Heights Neighbourhood represents an opportunity to establish a more sustaining pedestrian oriented and environmentally aware community, using the following Sustainability directives:

### LIVING LIGHTLY

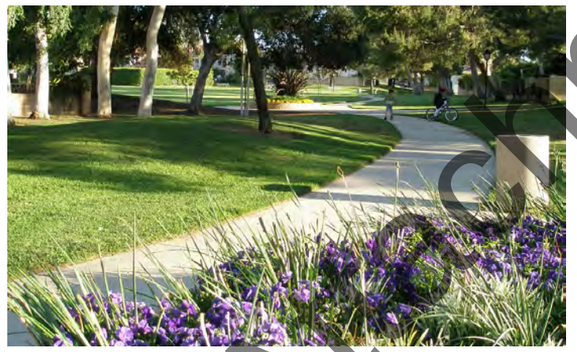
- Design compact, walkable neighbourhoods
- Plan for alternative transportation
- Employ sustainable infrastructure

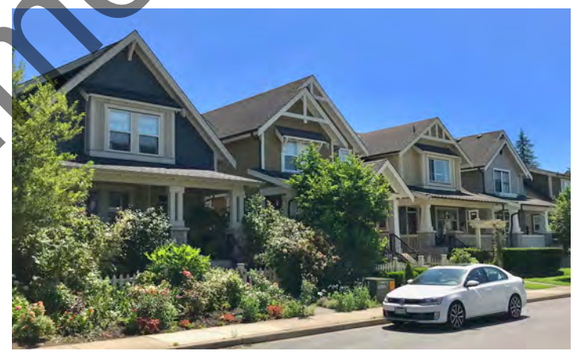
### WORKING WITH NATURE

- Conserve the ecological integrity of the Holland Creek Riparian Area + Arbutus Hump
- Create an integrated network of parks, natural spaces, and recreational trails
- Celebrate and respect natural heritage
- Conserve natural lands for recreation and parks

### LIVING LOCAL

- Accommodate a range of lifestyles, life-stages + Incomes.
- Support an economically sound community
- Create a sense of place, celebrating local art and culture







## DESIGN APPROACH

The design of the Neighbourhood represents an opportunity to work with the land in establishing a compact walkable neighbourhood with a diverse range of housing on nature's doorstep:

**Work with the Land:** Leverage the natural topography, employing hillside forms to minimize impact while maximizing access and views.

**Preserve Views + Privacy:** Utilize 219 landscape covenants to conserve natural landscape while protecting view corridors.

**Enhance the Neighbourhood:** Complete streets with homes that address their neighbours, and offer park-front living.

**Distribute Traffic:** Establish Colonia Drive Collector extension with a looping Local Street pattern.

**Variety of Homes:** Ensure a diversity of Single Family and Townhomes with both front driveways and rear lanes.

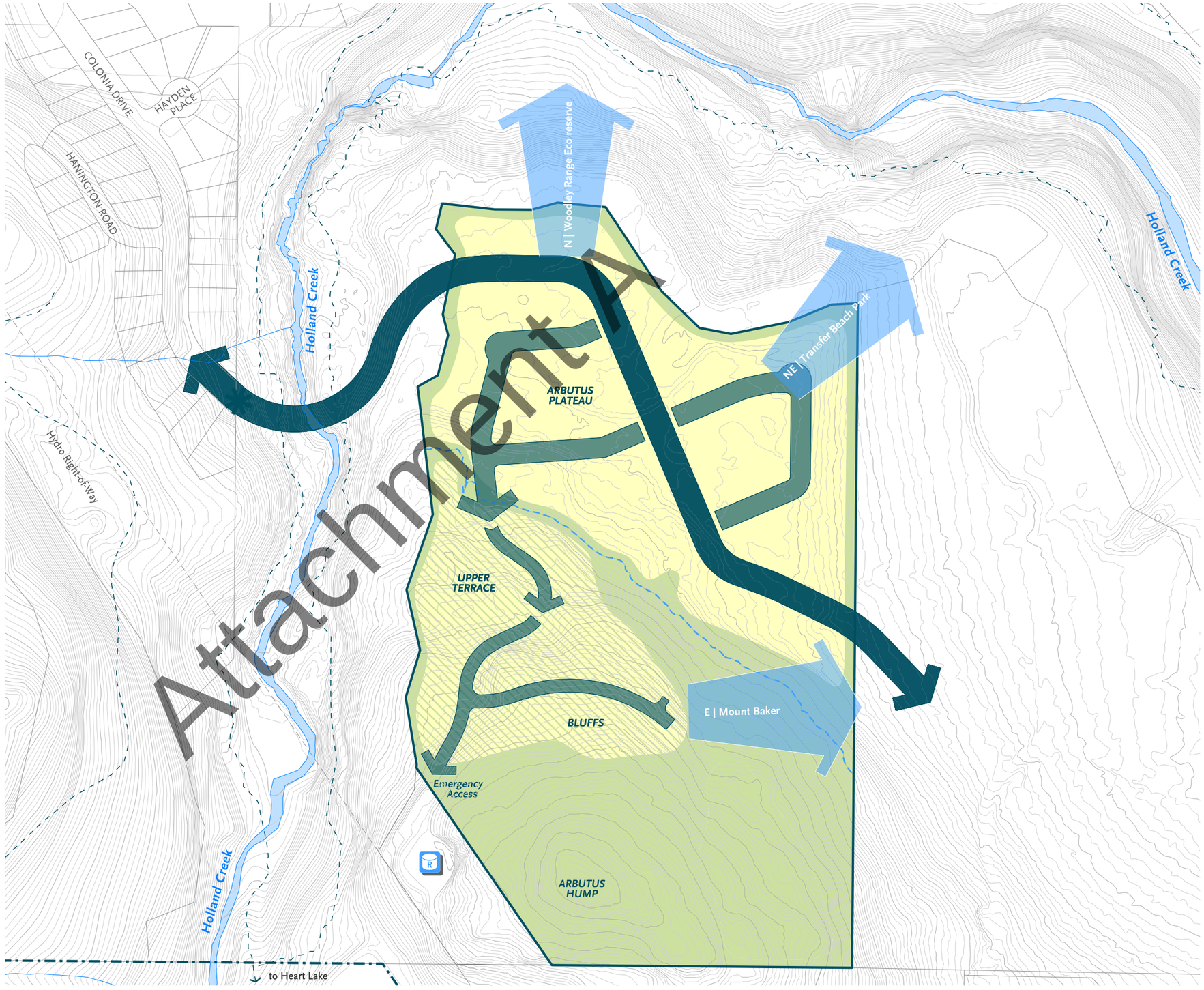
**Prioritize the Pedestrian:** Design tree-lined streets and dedicated connecting network of sidewalks + trails minimizing conflicts with cars.

**Establish Parks:** Create a new central neighbourhood park, offering a community gathering space and active play with connections to the Arbutus Hump lookout and Holland Creek recreation network.

# STRUCTURING PLAN

## FITTING THE LAND

- The central challenge involved in envisioning the neighbourhood is to maintain a strong connection with natural landscape features, including Arbutus Hump and Holland Creek. The Neighbourhood design thoughtfully responds to the land's distinctive features and provides a series of neighbourhood clusters with a variety of housing types while preserving and offering public access to the summit of Arbutus Hump.
- The site is structured by the extension of the Colonia Drive collector with a connected local street pattern intersecting the collector to the east and west. Above the water service line, a Strata Street provides access to the hillside enclave, sitting below Arbutus Hump.
- The neighbourhood streets include street trees, pedestrian and cycling friendly facilities linking natural and active parks as part of the future linkage between North and South Ladysmith.
- New trails provide outdoor recreation opportunities and connect to the Holland Creek trail network and Arbutus Hump.



# NEIGHBOURHOOD CONCEPT PLAN

## A HOME FOR EVERYONE

- Reflecting living on natures doorstep, the plan offers a variety of housing types to support a range of family lifestyles, life stages and incomes, and includes:
    - 110 Single-Family Homes | fee simple;
    - 32 Single-Family Homes | strata, and;
    - 26 Townhomes | strata.
- The development structure takes direction from the land use pattern established in the Holland Creek Local Area Plan.
- The plan offers 168 homes, averaging 3.9 UPA.


Site Boundary
*16.95 ha | 41.88 ac*

Legal Property Lines

Future Access Road ROW

5m Contour Interval

1m Contour Interval

Watercourse

Existing + Proposed Trail Network

Reservoir

Current Site Access Point

EL120m Service Boundary

Neighbourhood Park

Stormwater Pond

| LAND USE | | |
|---|---|---|
| 32% | Single Family - Fee Simple | *5.34 ha \| 13.20 ac* |
| 12% | Single Family - Strata | *2.10 ha \| 5.19 ac* |
| 2% | Multi Family - Strata | *0.38 ha \| 0.94 ac* |
| 3% | Strata Road | *0.58 ha \| 1.43 ac* |
| 2% | Strata Natural Area | *0.22 ha \| 0.56 ac* |
| 2% | Public Park | *0.38 ha \| 0.94 ac* |
| 33% | Public Natural Park | *5.54 ha \| 13.69 ac* |
| 13% | Public Road ROW | *2.13 ha \| 5.26 ac* |
| 100% | | *16.95 ha \| 41.88 ac* |

**CONCEPTUAL PLAN |** For Illustrative Purposes only. Final design to be determined through Development Permit.

# PARKS AND TRAIL PLAN

## CONNECTING WITH NATURE

Recognizing and respecting the value of the lands for their ecological significance, the Neighbourhood design weaves a series together a series of active trails, protected natural areas, and public parks. Over five kilometres of new sidewalks, trails and MUP's are added through the Neighbourhood Concept.

The new proposed trail system offers a community wide destination with access to the Arbutus Hump. The trail system connects with the existing trail network within the Holland Creek and Heart Lake recreation corridors.

A active park is proposed at the centre of the Neighbourhood to serve as a community heart and social gathering place and trailhead for access to the Arbutus Hump.

A minimum vertical separation distance of 25 metres is achieved between the nearest home and the Summit of the Arbutus Hump to ensure sufficient visual and physical separation.


LEGEND — NOVEMBER 2021

- Site Boundary *16.95 ha | 41.88 ac*
- Legal Property Lines
- Future Access Road ROW
- 5m Contour Interval
- 1m Contour Interval
- Watercourse
- Reservoir
- Current Site Access Point
- EL120m Service Boundary
- EL120m Service Boundary
- Existing Trail Network
- Public Multi-Use Path | 3.0m
- Public Trail | 1.5m
- Public Sidewalk | 1.5m
- Strata Pathway | 1.2m
- Neighbourhood Park
- Trail Connections
- Biking
- Stormwater Pond

**CONCEPTUAL PLAN |** For Illustrative Purposes only. Final design to be determined through Development Permit.

# HOLLAND HEIGHTS
# COMMUNITY BENEFITS

## COMMUNITY CONNECTOR

### REALIZING THE AREA PLAN

- Following the Area Plan, the proposed extension of Colonia Drive to Dogwood is critical to providing the required municipal roads and services to the designated growth area. Lamont Land has begun the process of completing this connection with the approval and construction of the Holland Creek Bridge Crossing.
- Extending from the Holland Creek Crossing, the Neighbourhood incorporates the required Urban Collector serving to connect the future Neighbourhood with the surrounding community.
- The Collector will reduce traffic demand on Dogwood Drive and serve as a new cycling, pedestrian, and vehicle connection between north and south Ladysmith, completing the vision established in the Official Community Plan and Holland Creek Local Area Plan.

## WALKABLE NEIGHBOURHOOD

### MAKING THINGS WALKABLE

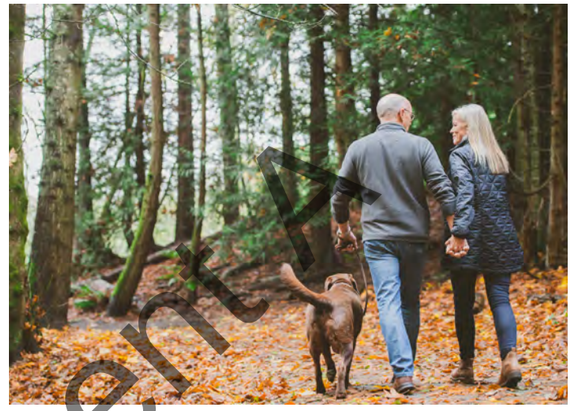
- A network of tree-lined pedestrian and cycling pathways are incorporated within the public + strata street network.

### MAKING THINGS SAFE

- A gateway experience is established through the Holland Creek collector re-enforcing the neighbourhood's natural setting.
- Streets are tree lined, extensively landscaped, and include pedestrian scaled lighting.
- Homes are street fronting and address the public realm with "eyes on the street + parks".

### TRADITIONAL NEIGHBOURHOOD

- Homes serviced by rear lanes serve to reduce pedestrian conflict while strengthening the relationship to the public realm.



## CELEBRATING NATURE

### CONNECTING WITH NATURE

- Recognizing and respecting the value of the lands for their ecological significance, the Neighbourhood design weaves a series together a series of active trails, protected natural areas, and public parks. Over five kilometres of new sidewalks, trails and MUP's are added through the Neighbourhood Concept.
- The new proposed trail system offers a community wide destination with access to the Arbutus Hump. The trail system connects with the existing trail network within the Holland Creek and Heart Lake recreation corridors.
- A active park is proposed at the centre of the Neighbourhood to serve as a community heart and social gathering place and trailhead for access to the Arbutus Hump.
- A minimum vertical separation distance of 25 metres is achieved between the nearest home and the Summit of the Arbutus Hump to ensure sufficient visual and physical separation.

## HOUSING DIVERSITY

### A HOME FOR EVERYONE

- Reflecting living on natures doorstep, the plan offers a variety of housing types to support a range of family lifestyles, life stages and incomes, and includes:
    - 109 Single-Family Homes | fee simple;
    - 33 Single-Family Homes | strata, and;
    - 30 Townhomes | strata.
- The development structure takes direction from the land use pattern established in the Holland Creek Local Area Plan.
- The plan offers 168 homes, averaging 3.9 UPA, below the projected density of 200 units.

# HOLLAND HEIGHTS CONCEPT

## DESIGN FEATURES

1. **Diversity of Home Forms + Sizes**: 168 Single Family + Townhomes provide for a variety of lifestyles, life stages and incomes.
2. **Respecting the Arbutus Hump**: The Arbutus Hump summit is preserved and visually separated from the Neighbourhood while giving access to the public to enjoy the views.
3. **Connections to Nature**: The Neighbourhood Concept preserves ~30% for Active and Nature Parks including a new trail network that connects the existing Holland Creek Trail System to the summit of the Arbutus Hump.
4. **Pedestrian Friendly:** Coherent pattern of streets, lanes and sidewalks promote walking and cycling.
5. **Park-front Living:** Series of park-fronting homes enhance Village character and safety with "eyes on the park."
6. **Traditional Character:** Home styles and architectural details that celebrate Kettle Valley's form and character.
7. **Linking Ladysmith**: Colonia Drive extension across Holland Creek, provides municipal roads and servicing that will eventually to link North and South Ladysmith by an alternative route.


**CONCEPTUAL PLAN |** For Illustrative Purposes only. Final design to be determined through Development Permit.

# HOLLAND HEIGHTS | Design Summary

EKISTICS November 2021

# Section 3 | **TECHNICAL APPENDICES**

NEWCASTLE
ENGINEERING LTD.

#4-3179 BARONS ROAD, ROAD, NANAIMO V9T 5W5

PHONE: (250) 756-9553 FAX: (250) 756-9503

November 24, 2021 0831-020

Lamont Land Inc.
**Attn.: Mr. Scott Lamont**
200-5716 1 Street SE
Calgary, AB T2H 1H8

By email: scott@lamontland.com

Dear: Mr. Lamont

**RE: SITE SERVICING REPORT TO SUPPORT REZONING APPLICATION FOR THE PROPOSED HOLLAND HEIGHT DEVELOPMENT OF REMAINDER LOT 5, PLAN VIP75559, OYSTER DISTRICT.**



## 1. INTRODUCTION

Newcastle Engineering Ltd was retained to conduct a servicing study to support the rezoning application for Remainder Lot 5, Plan VIP75559, Oyster District which forms a portion of the area outlined by the Town of Ladysmith in Holland Creek Area Plan (HCAP). The HCAP is composed of several properties of which only the above-mentioned property is included in this rezoning application. However, the remaining two lots within the HCAP will require the extension of servicing through the properties in order to provide services to the parcel included in the rezoning application. Therefore, the area under review will be defined as onsite works for the lots included with the rezoning and offsite works for the remaining two lots that will require serving extensions to the subject property but are not included in the rezoning application, see drawing 0831-020-100 in Appendix 1 for a site plan showing these areas.

The subject property is the Holland Heights Neighborhood and the legal description is Remainder Lot 5, Plan VIP75559, Oyster District.

The lots comprising the offsite works areas are Lot A, District Lot 110E&N, Oyster District, Plan VIP75849 and Part of Lot A, Block 192 & District Lot 103, Oyster District, Plan EPP63594, Except Plan EPP67741, EPP75579, EPP80490, EPP98460 and EPP98461 and Part of Lot 1, Block 192 & District Lot 103, Oyster District, Plan EPP67741. These properties make up the remainder of the HCAP.

Holland Creek borders the subject property on the west and the north and is zoned as park land. This strip of park provides a buffer between the proposed development and the existing single family residential lots off of Colonia Drive to the west and Malone Road to the north. On the south west boundary of the site are Town of Ladysmith lands

which house a water storage reservoir. Final, the south side of the property is bordered by existing park land on the Arbutus Hump.
Currently, the subject property is zoned R-1 Single Family Residential and is comprised of forested areas and recently logged sections.

The rezoning proposal is to create a comprehensive development zone for the subject property or Town of Ladysmith existing zones with no proposed increase in the allowable density. Each of the lots created at the time of subdivision will be provided with a municipal water, sanitary and storm service.

## 2. WATER DISTRIBUTION

### 2.1. EXISTING INFRASTRUCTURE

The Town of Ladysmith has two sources for their water supply the first being the Stocking Lake reservoir and secondary intake structure on Holland Creek. Both sources feed into the reservoir located on the Arbutus Hump prior to distribution throughout the Town. The Top Water Level of the Arbutus Hump reservoir is 163m which gives a maximum service area up to the 130m elevation. The TWL of the Arbutus Hump reservoir and the topography of the Town of Ladysmith necessitate that there are several pressure zones within the distribution system.

Directly to the south of the subject property is the Town of Ladysmith reservoir that feeds both the high and low pressure zones. Distribution mains run from the reservoir west to Colonia Road to feed North Ladysmith and southeast around the Arbutus hump to feed south Ladysmith.

AS part of the crossing extension of Colonia a new 450mm PVC water main is being installed and will be capped off at the west property line of the onsite area.

### 2.2. POPULATION PROJECTIONS

The population projections for the onsite area are based on a proposed density of 170 units which is taken from the lot layout provided by Ekistics. For the offsite areas, the unit counts are conceptual and based on input from the respective property owners for the remaining lots in the HCAP. A value of 2.3 people per unit was used in calculating the projected population for residential units within on and offsite areas. The table below summarizes the unit distribution per area and the projected population at total build out:



**Table 1: Population Projections**

| Location | Lots | Comprehensive Development Zone | Single Family Residential (units) | Low Density Residential (units) | Population Density (ppu) | Total Population |
|---|---|---|---|---|---|---|
| Onsite | REM. LOT 5 Plan 75559 | 168 | | - | 2.3 | 387 |
| Offsite | Part Rem. A Plan EPP63594 | | 300 | 310 | 2.3 | 1403 |
| | Rem. LOT A Plan 75849 | | 176 | - | 2.3 | 405 |

### 2.3. WATER DEMAND PROJECTIONS

Based on information taken from the "Town of Ladysmith /Saltair Water Supply & Distribution Preliminary Design, Final Report" dated July 18, 2003 by Earth Tech water Quality & Treatment the per capita demands are calculated to be:

Average Day Demand (ADD) = 482 lpcd
Maximum Day Demand (MDD) = 1,019 lpcd
Peak Hour Demand (PHD) = 2,030 lpcd

Using the above per capita demand values with the population projections for both the on and offsite area's the calculated water demand are:

**Table 2: Water Demand Projections**

| Location | Lots | Average Day Demand (lps) | Maximum Day Demand (lps) | Peak Hour Demand (lps) |
|---|---|---|---|---|
| Onsite | REM. LOT 5 Plan 75559 | 2.2 | 4.6 | 9.1 |
| Offsite | Part Rem. A Plan EPP63594 | 7.8 | 16.5 | 33.0 |
| | Rem. LOT A Plan 75849 | 2.3 | 4.8 | 9.5 |



### 2.4. FIRE DEMAND CRITERIA

Fire demand criteria within the onsite area is as per the Town of Ladysmith Engineering Standards and Specifications Manual section 4A which requires that fire demand be in accordance with the "Water Supply for Public Fire Protection" as published by the Fire Underwriter's Survey. Fire demand calculations using the Fire Underwriter's Survey are a function of the building size, type and location and as such it will be necessary to calculate the worst case demand within a given area at the detailed design stage.

### 2.5. WATER DEMAND CRITERIA

Water demand design criteria are from the Town of Ladysmith Engineering Standards and Specifications Manual section 4A. Any proposed water system upgrades must be able to meet these requirements under various demand scenarios. The criteria for adequate system design are:

Maximum desired Static Pressure = 700kPa (100psi)
Minimum Pressure – PHD = 275 kPa (40psi)
Minimum Pressure – MDD + Fire at hydrant = 140 kPa (20psi)
Minimum Static Pressure at building site = 275 kPa (40psi)

### 2.6. PROPOSED DISTRIBUTION NETWORK

The existing ground elevation on the subject property ranges from approximately 95m in the northeast corner to 190m at the peak of Arbutus hump in the south. Therefore, portions of property will be within existing high-pressure zone while the lands in the south above 130m will be unserviceable with the current pressure zones.

A high-pressure distribution system will be required to service areas of between 85m and 130m. At least two connections to the existing high pressure distribution main that borders the property will be required to facilitate the effective looping of the watermains. The proposed high pressure distribution main will be designed to allow for its extension through the offsite lands to the east in order to service those properties and complete a secondary loop to the existing main that runs parallel to the Town boundary on the south side of the offsite lands. Confirmation of sizing and configuration of mains associated with the high-pressure system will be required during detailed design. a preliminary water main layout for the onsite area can be found on drawing 0831-020-103 in Appendix 1.

At this time sections of the subject property that are above 130m cannot be serviced from the existing Town of Ladysmith water system without the addition of booster pumps. These lands are proposed as a private strata development and a private booster pump system will be required to provide adequate flows and pressure for both domestic and fire flow scenarios. The location and size of the pump station will be determined as part of the detailed design associated with that phase of development.



## 3. SANITARY SEWAGE

### 3.1. EXISTING INFRASTRUCTURE

The Town of Ladysmith has a waste water treatment plant, located at the south end of Oyster Cove Road, which is the terminus for the sanitary sewage collection system. The sanitary sewage collection system has two main tributary areas with Holland Creek forming the boundary between the northern and southern areas. Sanitary drainage south of Holland Creek is collected mainly by a gravity sewer system with an area north of the Trans-Canada highway being serviced by a force main. The connection point for the sanitary force main to the gravity main is approximately 160m south east of the intersection of Davis Road and the Trans-Canada Highway. All of the sanitary effluent is directed to a trunk main located along the TransCanada Highway which flows to the northwest and feeds into the waste water treatment facility.

The HCAP is currently serviced by a 200mm main that runs east along Rollie Rose Drive to Dogwood Drive. From Dogwood the main run through the Ladysmith golf course before turning to the south east and connecting with the main on Davis Road.
A 100mm force main is being constructed as part of the Colonia Drive extension to the subject property. This force main will connect to the existing gravity system that flows north along Colonia Drive.

### 3.2. SANITARY SEWER FLOWS

Sewage flows for the on and offsite areas were calculated as per the Town of Ladysmith Engineering Standards and Specifications section 5A and the completed sanitary sewer flow calculation sheet can be found in Appendix 2. The total flow from the onsite area is 9.4l/s while the total flow from the HCAP is 33.2l/s

The existing main that runs downstream of the ball fields was previously identified as having insufficient capacity to convey the flow from the total build out of all lands within the HCAP. The existing 200mm main downstream from the ball fields on Dogwood

Drive has a design capacity of 27.4 L/s. Therefore, upgrades to the downstream gravity system will be required once a total unit count of 610 units is reached within the Holland Creek Area Plan.

### 3.3. PROPOSED SANITARY SEWER SYSTEM

The onsite sanitary sewer system will be a gravity system and will be designed as per the town of Ladysmith's Engineering Standards and Specifications section 5A. A schematic plan for the sanitary sewer system in the onsite area has been prepared and can be found on drawing 0831-020-104 in Appendix 1. Pipe size and location are to be confirmed during detailed design. The sanitary main will extend through the offsite lots to connect to the existing sanitary sewer stub in Rollie Rose Drive, the location of this main will need to be coordinated with the adjacent land owners to ensure the routing meets the development requirements for those lands, see drawing 0831-020-106 in Appendix 1 for a conceptual layout

Should the timing of the gravity main extension to the east through the offsite areas not meet the development goals for the subject property it could be possible to utilize the 100mm force main being installed along Colonia Drive. Onsite sewage would need to be collected at a pump station via the above-mentioned gravity system. The effluent would then be pumped via a force main to make the connection to the stub on Colonia drive. Analysis of the downstream mains would be required at the time of detailed design to confirm downstream capacity of this system.

Once 610 units have been constructed within the HCAP this will trigger the need for upgrades of the existing system downstream from the ball fields. The upgrades will require the replacement of the existing 200mm main with a 250mm main, the routing and pipe size would be determined at as part of that detailed design process.

## 4. STORM WATER

### 4.1. EXISTING DRAINAGE CONDITIONS

The topography of the onsite area is comprised of a district high point, the arbutus hump, in the south of the property which then slopes down to a terrace in the north. This terrace general slopes to the northeast and northwest and drains into Holland Creek. There are no defined drainages that cross the onsite area so flow is presumed to be a combination of shallow sheet flow and in ground interflow.

Holland Creek is a fish bearing waterways and contains flow year-round. Improvements have been made to Holland Creek for habitat restoration and in particular salmon spawning features have been added to the creek west of the site. These improvements include constructed side channels and placement of wood debris. The improvements have been installed from the E&N railway culvert to several hundred meters upstream of the Dogwood Drive bridge.

There is a mix of vegetation ranging from mature forests on Arbutus Hump to recently logged sections, a detailed description of the existing vegetation can be found in the report titled "Environmental Assessment for Proposed Holland Heights Subdivision, Development Permit Area 11" by Corvidae Environmental Consulting Inc.

### 4.2. STORM WATER MANAGEMENT

The intent of the Storm Water Management plan (STWMP) is to maintain the watershed function and quality through a combination of retention of green space and manmade features. This section identifies the positive measures this development proposes for storm water management onsite along with challenges and methods that will be implemented to address concerns regarding managing rainfall on this specific site in an environmentally sensitive manner to mitigate the potential for future problems. A preliminary storm drainage management area plan, 0831-020-105 has been prepared and is included in Appendix 1 of this report.

Retention of green space is an important factor in maintaining the predevelopment function of the watershed as retained green spaces will have no net impact on the ground water regime or watershed function. Provision of green spaces will be through the preservation of existing vegetated areas and the creation of manmade green spaces.

The goal of the STWMP is to mimic as closely as possible the predevelopment functionality of the watershed, with flows to Holland Creek being maintained at the predevelopment frequency and volumes. This may require multiple discharge points to the holland creek. Runoff onsite will generally be collected in piped systems and conveyed to the discharge points by way of pipe systems. Diversion structures will be used to regulate the flow rate into Holland Creek at set predevelopment values. Each potential discharge point will require its own design and due to site constraints, there is no single approach that can be applied in all locations. Drainage areas and the associated discharge point can be found on the storm water management plan included in Appendix 1.

In addition to maintaining the surface flows into Holland Creek, storm water management features will be included in lot development to facilitate the recharge of the ground water. Single family residential lots will be equipped with on-site detention/infiltration structures to both facilitate ground water recharge and attenuate the runoff flow rate. On multi-family sites a combination of facilities ranging from rain garden, bio-swales and detention facilities will be implemented on a site by site basis.

Runoff from road ways may require volume/frequency control as well as quality control. Some methods of source control for the road ways are vegetated bioswales, rain gardens community stormwater management features such as ponds or inground detention tanks. In areas were the grade of the road is too steep to allow for the use of swales standard detention facilities may be required and could be in the form of oversized pipes complete with a diversion manhole for the regulation of the discharge flow rate. These detention facilities could be located under the road way or in town parks.



### 4.3. STORM WATER RUNOFF QUALITY

As mentioned previously, the onsite runoff is tributary to fish bearing creeks and as such it is important to treat the storm water to ensure water quality of the streams is not negatively impacted by the quality or quantity of the post-development storm water runoff.

Periods of construction are a potential source of pollution in the form of silts and other fine particles suspended in the storm water runoff and each phase of the project will require a site specific erosion and sediment control plan be put in place prior to

commence of work, with the recommended measures being maintained until completion and establishment of landscaping.

A combination of the following measures may be incorporated into the detailed design of the storm water management system to address runoff water quality:

- Where possible, runoff from paved roadways will be directed to bioswales, rain gardens or constructed wetlands to remove silts, hydrocarbons and heavy metals prior to connection to the storm sewer system;
- Runoff from multi-family residential parking areas will be directed through bioswales, rain gardens or alternate filtration devices for silt, hydrocarbon and heavy metal removal.
- Catchbasins will be installed along roadways, equipped with hooded outlets to provide some silt and hydrocarbon removal.

### 4.4. STORM WATER DETENTION VOLUMES

We have performed a preliminary analysis of pre and post development flow conditions for onsite areas and calculated the resulting required storage volumes based on limiting the post development 10-year return period flow rate to the 10-year pre-development flow rate. Preliminary detention volumes were calculated for each of the differing drainage areas as outlined in the preliminary storm water management plan in Appendix 1. The rational method was used for this calculation with and are reported based on an assumed discharge point for each area. The required detention volumes will be achieved through the use of various facilities as outline in the preceding sections which will be distributed throughout the associated drainage area.

Both runoff flow rate and preliminary detention volumes were calculated using the rational method. The total required preliminary detention volume for each drainage areas are found in the Table 3, refer to Appendix 3 for calculation details. These volumes will be refined during detailed design of each phase of the development.

**Table 3: Preliminary Storm Water Detention Volumes**

| Contributing Drainage Area | Discharge Location | Drainage Area Detention Volume ($m^3$) |
|---|---|---|
| A | 1 | 170 |
| B | 1 | 316 |
| C | 2 | 22 |
| D | 3 | 13 |
| E | 4 | 22 |



## 5. CONCLUSION

Connection points to the existing water distribution systems are located adjacent to the site at multiple locations. Confirmation of onsite pipe sizing and configuration will be established during detailed design. The water systems adjacent to the study area will require analysis by the Town of Ladysmith to determine if any off-site upgrades are

required to meet the serving requirements outlined in this report. In addition, a private onsite booster pump station will be required to service any proposed development above the 130m contour.

A sanitary sewer will be required to be extended to the subject property form the existing stub on Rollie Rose Drive. This gravity system will require upgrades downstream of the HCAP once a unit count of 610 unit Is reach within the HCAP. A secondary sewer servicing option is to use the existing forcemain in Colonia Drive to accept sewage from the onsite area. this option would require the construction of an onsite forcemain and lift station.

Storm sewer services can be provided to the proposed lots that meet the Town of Ladysmith standards. The goal of the storm water management system will be to mimicking the pre-development functionality of the watershed through the use of the various storm water management features mentioned in the previous section.

Please contact our office if you require additional information regarding the proposed servicing of this project.

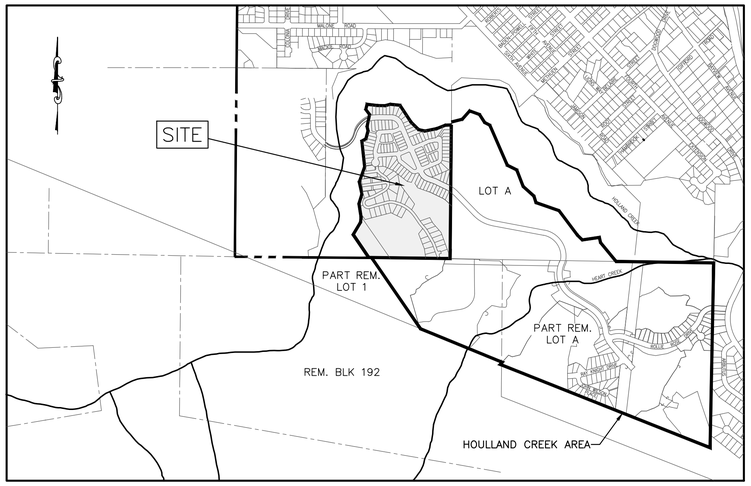
Yours truly,

**Newcastle Engineering Ltd.**
EGBC Permit to Practice Number 1000856

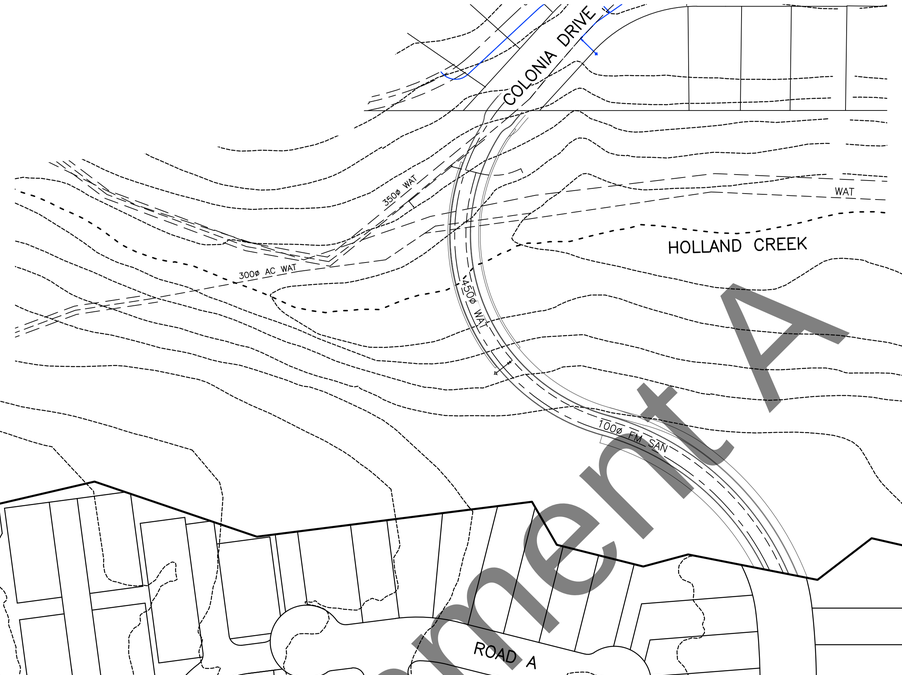

NOV 24 2021

Drew Beiderwieden, P.Eng

Appendix 1

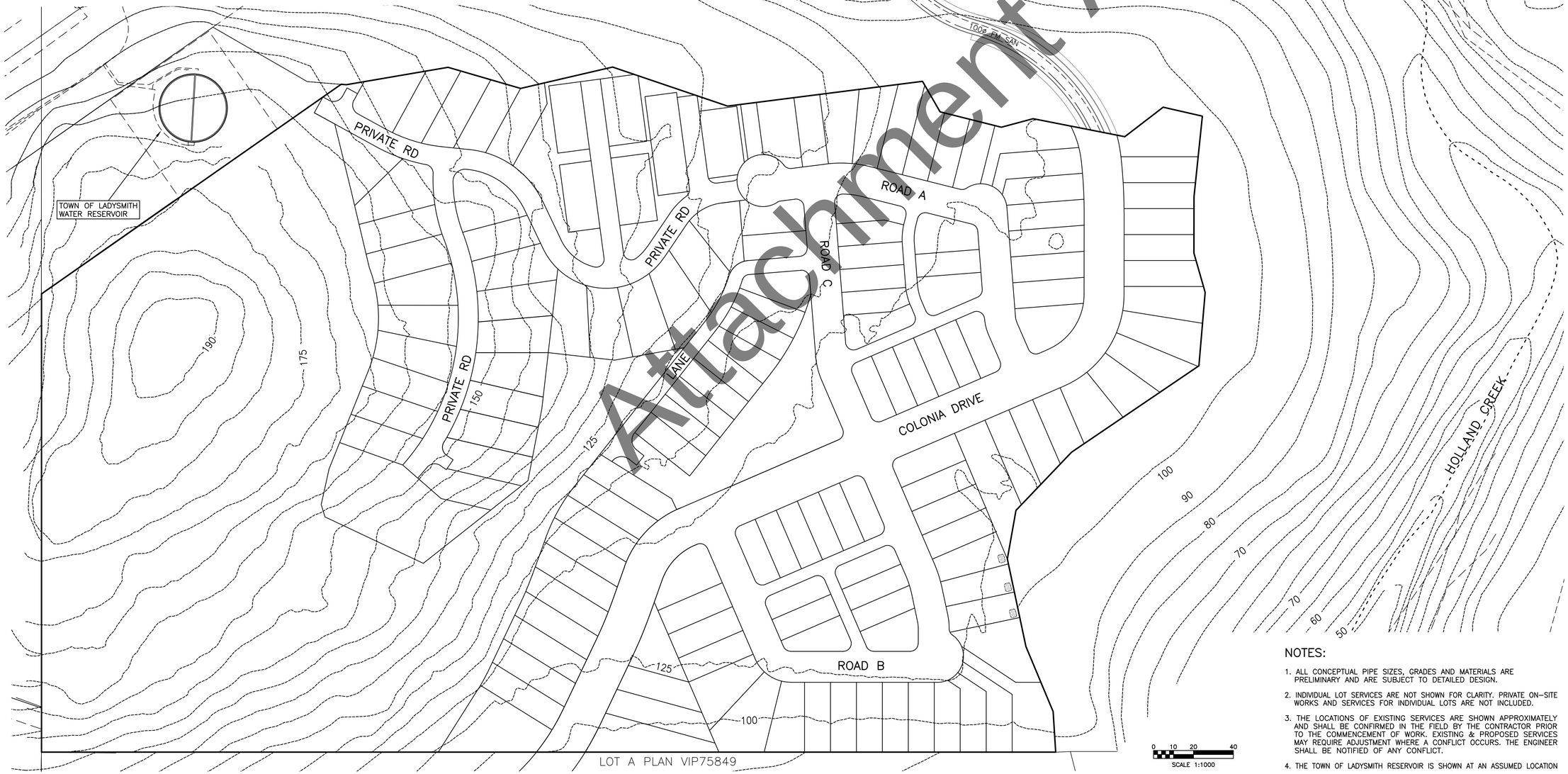



LOCATION PLAN
N.T.S.




## DRAWING SCHEDULE

| NEL DWG No. | REVISION | TITLE |
|---|---|---|
| 0831-020-100 | REV01 | SITE PLAN |
| 0831-020-101 | REV01 | PRELIMINARY ROAD WORKS PLAN |
| 0831-020-102 | REV01 | PRELIMINARY WATER SERVICING PLAN |
| 0831-020-103 | REV01 | PRELIMINARY SANITARY SERVICING PLAN |
| 0831-020-104 | REV01 | PRELIMINARY STORM WATER SERVICING PLAN |
| 0831-020-105 | REV00 | PRELIMINARY OFFSITE CONNECTION PLAN |






NOTES:

1. ALL CONCEPTUAL PIPE SIZES, GRADES AND MATERIALS ARE PRELIMINARY AND ARE SUBJECT TO DETAILED DESIGN.
2. INDIVIDUAL LOT SERVICES ARE NOT SHOWN FOR CLARITY. PRIVATE ON-SITE WORKS AND SERVICES FOR INDIVIDUAL LOTS ARE NOT INCLUDED.
3. THE LOCATIONS OF EXISTING SERVICES ARE SHOWN APPROXIMATELY AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORK. EXISTING & PROPOSED SERVICES MAY REQUIRE ADJUSTMENT WHERE A CONFLICT OCCURS. THE ENGINEER SHALL BE NOTIFIED OF ANY CONFLICT.
4. THE TOWN OF LADYSMITH RESERVOIR IS SHOWN AT AN ASSUMED LOCATION

0 10 20 40
SCALE 1:1000

NEWCASTLE
ENGINEERING LTD.
4-3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756-9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, PLAN VIP75559

LEGEND

| PROP. | EXIST. |
|---|---|
| WATERMAIN | |
| STORM SEWER | |
| SANITARY SEWER | |
| GAS MAIN | |
| ELECTRICAL DUCT | |
| INLET/OUTLET HEADWALL | |
| DITCH INLET/OUTLET | |
| SWALE | |
| EDGE OF PAVEMENT | |
| VALVE BOX | |
| LIMIT OF CONSTRUCTION | |
| HYDRANT | |
| ABOVE GROUND FLUSHOUT | |
| BELOW GROUND FLUSHOUT | |
| CATCHBASIN | |
| DITCH INLET CATCHBASIN | |
| MANHOLE | |
| CLEANOUT | |
| HYDRO POLE | |
| CAP | |
| STREETLIGHT | |
| FENCE | |

NOTE:

ENGINEER'S SEAL

DESIGN: DB
DRAWN: JTD
PLOT DATE: 11-23-21
PRINT DATE:
HORIZONTAL SCALE: 1:1000
VERTICAL SCALE:

CLIENT NAME

PROJECT NAME

ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE

SITE PLAN

PROJECT No. 0831-020
DRAWING No. 100
REVISION No. 01
CITY PLAN No.

11.23.2021 P:\AUTOCAD\0800\0831-020 ELLER PROPERTY, LADYSMITH\0831-020 PLA REV01

## NOTES:

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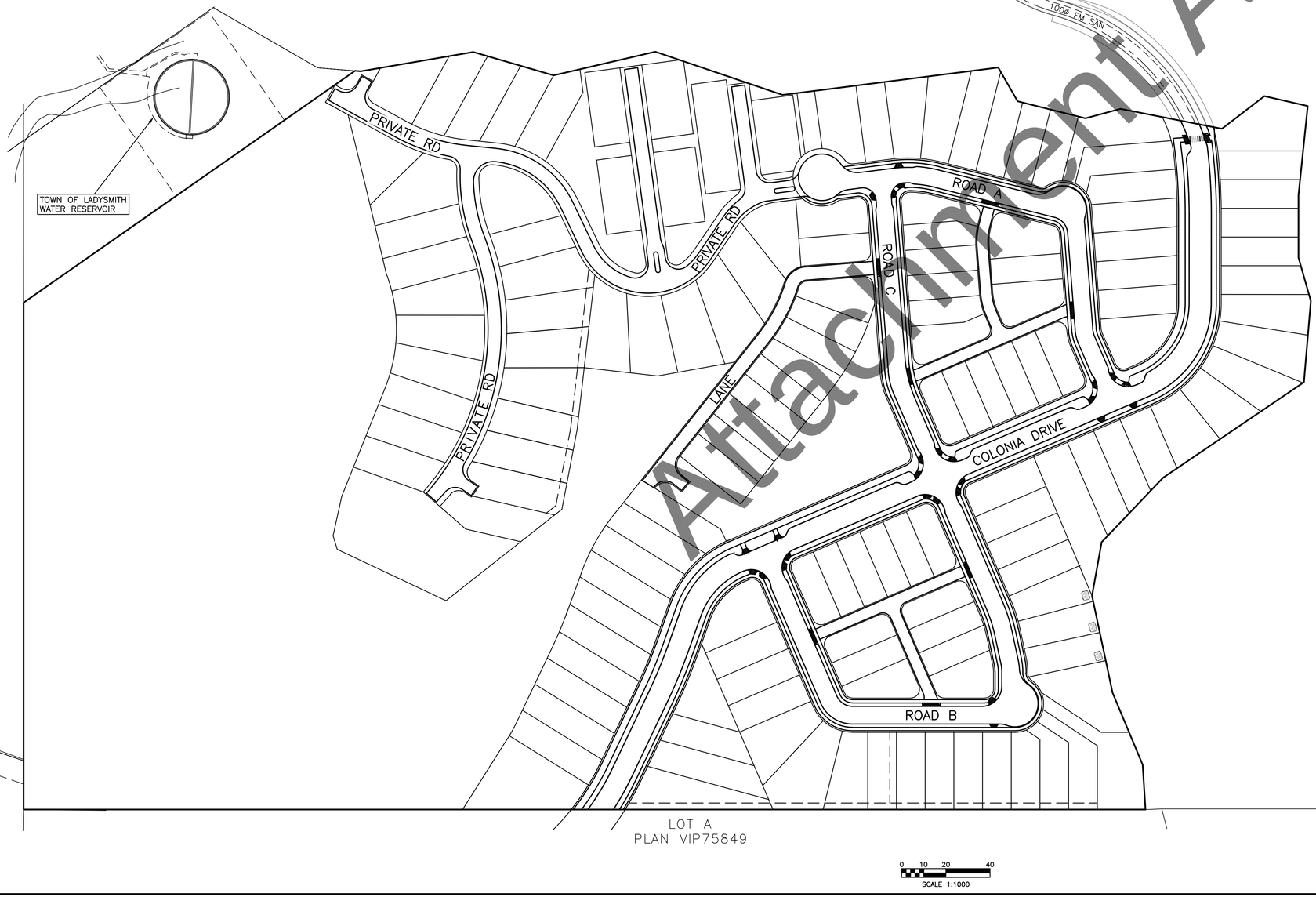
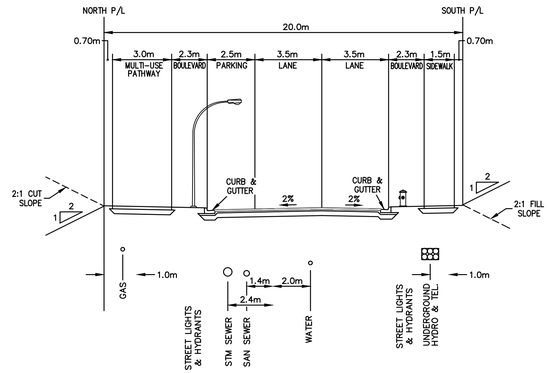
4. THE TOWN OF LADYSMITH RESERVOIR IS SHOWN AT AN ASSUMED LOCATION

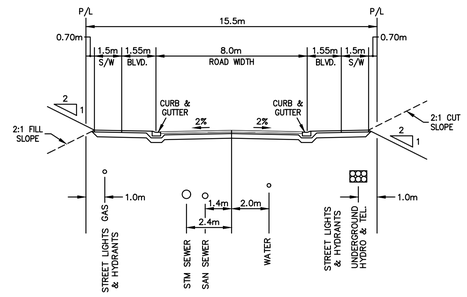



ROAD:

1. PAVED SURFACE – 75mm ASPHALT (COMPACTED THICKNESS)
2. BASE – 100mm CRUSHED GRAVEL (20mm MINUS)
3. SUB-BASE – 250mm PIT RUN GRAVEL (75mm MINUS)
4. NON-MOUNTABLE MONOLITHIC CURB AND GUTTER IN ACCORDANCE WITH STANDARD DRAWING C2.
5. EXTEND COMPACTED BASE MATERIAL 0.6m BEHIND AND TO THE TOP OF CURB WHERE NO SIDEWALK IN INSTALLED.
6. DEPTHS OF SURFACING AND BASE GRAVELS ARE MINIMUM AND IN SOME CASES WILL HAVE TO BE INCREASED TO MEET MAXIMUM ALLOWABLE BENKELMAN BEAM DEFLECTION.
7. INSTALL CURB DRAIN ON HIGH SIDE OF ROAD WHERE REQUIRED BY THE ENGINEER.
8. SUBJECT TO ENGINEERS APPROVAL SIDEWALK, STREETLIGHT AND HYDRANT OFFSETS MAY VARY.

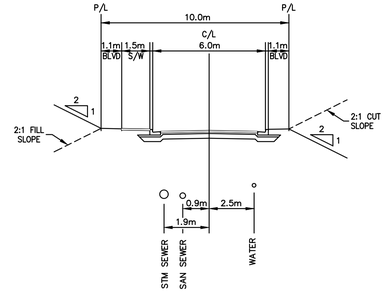
**COLONIA DRIVE CROSS SECTION**
N.T.S.




ROAD:

1. PAVED SURFACE – 50mm ASPHALT (COMPACTED THICKNESS)
2. BASE – 100mm CRUSHED GRAVEL (20mm MINUS)
3. SUB-BASE – 250mm PIT RUN GRAVEL (75mm MINUS)
4. MOUNTABLE MONOLITHIC CURB AND GUTTER IN ACCORDANCE WITH STANDARD DRAWING C1.
5. EXTEND COMPACTED BASE MATERIAL 0.6m BEHIND AND TO THE TOP OF CURB WHERE NO SIDEWALK IN INSTALLED.
6. DEPTHS OF SURFACING AND BASE GRAVELS ARE MINIMUM AND IN SOME CASES WILL HAVE TO BE INCREASED TO MEET MAXIMUM ALLOWABLE BENKELMAN BEAM DEFLECTION.
7. INSTALL CURB DRAIN ON HIGH SIDE OF ROAD WHERE REQUIRED BY THE ENGINEER.
8. SUBJECT TO ENGINEERS APPROVAL SIDEWALK, STREETLIGHT AND HYDRANT OFFSETS MAY VARY.

**ROAD A, B, AND C CROSS SECTION**
N.T.S.




ROAD:

1. PAVED SURFACE – 50mm ASPHALT (COMPACTED THICKNESS)
2. BASE – 100mm CRUSHED GRAVEL (20mm MINUS)
3. SUB-BASE – 250mm PIT RUN GRAVEL (75mm MINUS)
4. NON-MOUNTABLE MONOLITHIC CURB AND GUTTER IN ACCORDANCE WITH STANDARD DRAWING C1.

**PRIVATE ROAD CROSS SECTION**
N.T.S.



NEWCASTLE ENGINEERING LTD.
4–3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756-9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, VIP75559

LEGEND

| PROP. | EXIST. | |
|---|---|---|
| | | WATERMAIN |
| | | STORM SEWER |
| | | SANITARY SEWER |
| | | GAS MAIN |
| | | ELECTRICAL DUCT |
| | | INLET/OUTLET HEADWALL |
| | | DITCH INLET/OUTLET |
| | | SWALE |
| | | EDGE OF PAVEMENT |
| | | VALVE BOX |
| | | LIMIT OF CONSTRUCTION |
| | | HYDRANT |
| | | ABOVE GROUND FLUSHOUT |
| | | BELOW GROUND FLUSHOUT |
| | | CATCHBASIN |
| | | DITCH INLET CATCHBASIN |
| | | MANHOLE |
| | | CLEANOUT |
| | | HYDRO POLE |
| | | CAP |
| | | STREETLIGHT |
| | | FENCE |

NOTE:

ENGINEER'S SEAL

| | |
|---|---|
| DESIGN | DB |
| DRAWN | JTD |
| PLOT DATE | 11-23-21 |
| PRINT DATE | |
| HORIZONTAL SCALE | 1:1000 |
| VERTICAL SCALE | |

CLIENT NAME

PROJECT NAME

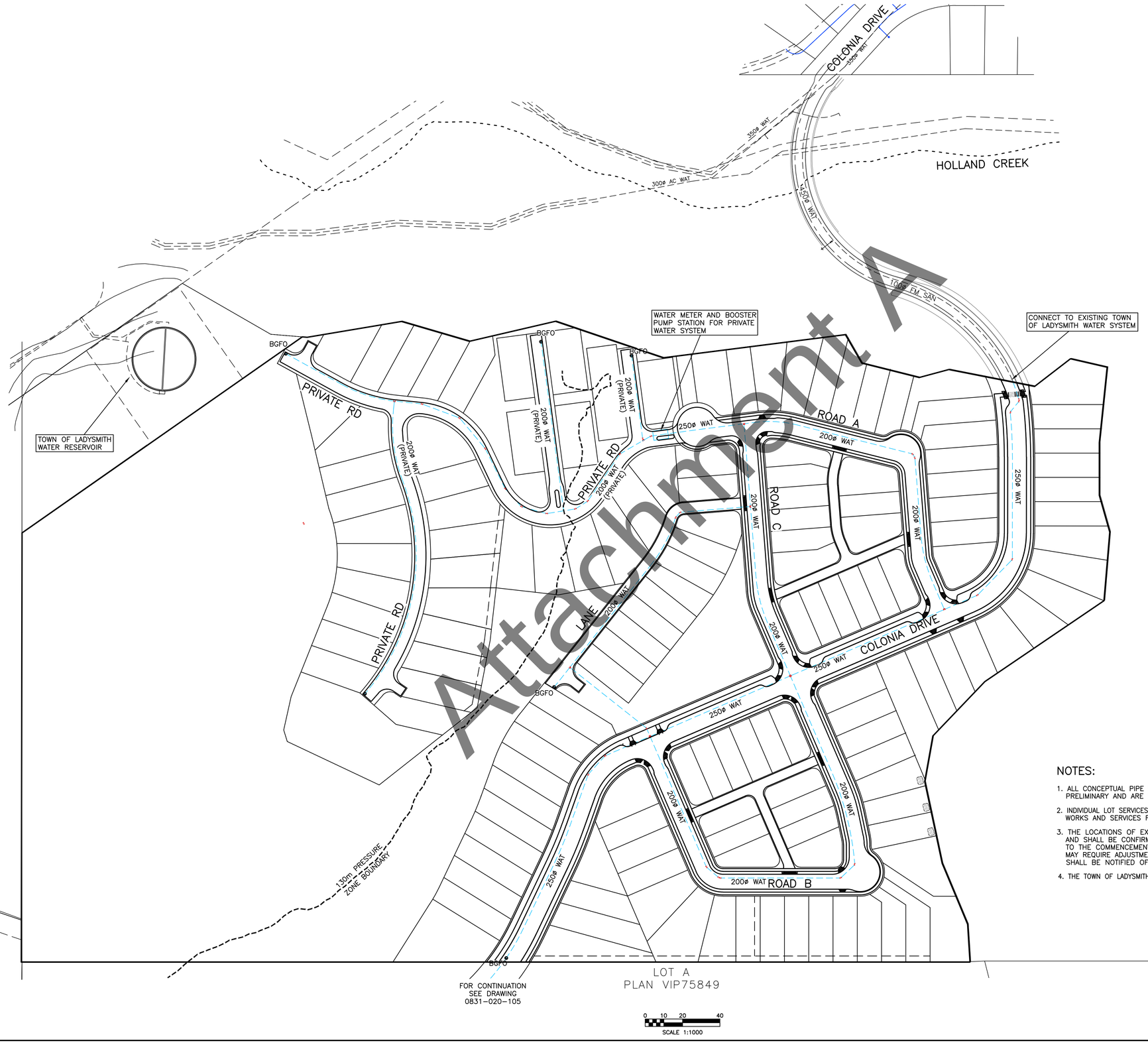
ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE

PRELIMINARY ROAD WORKS PLAN

| | |
|---|---|
| PROJECT No. | 0831-020 |
| DRAWING No. | 101 |
| REVISION No. | 01 |
| CITY PLAN No. | |

11.23.2021 P:\AUTOCAD\0800\0831-020 ELLER PROPERTY, LADYSMITH\0831-020 PLA REV01






## NOTES:

1. ALL CONCEPTUAL PIPE SIZES, GRADES AND MATERIALS ARE PRELIMINARY AND ARE SUBJECT TO DETAILED DESIGN.
2. INDIVIDUAL LOT SERVICES ARE NOT SHOWN FOR CLARITY. PRIVATE ON-SITE WORKS AND SERVICES FOR INDIVIDUAL LOTS ARE NOT INCLUDED.
3. THE LOCATIONS OF EXISTING SERVICES ARE SHOWN APPROXIMATELY AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORK. EXISTING & PROPOSED SERVICES MAY REQUIRE ADJUSTMENT WHERE A CONFLICT OCCURS. THE ENGINEER SHALL BE NOTIFIED OF ANY CONFLICT.
4. THE TOWN OF LADYSMITH RESERVOIR IS SHOWN AT AN ASSUMED LOCATION

NEWCASTLE ENGINEERING LTD.
4-3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756-9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, VIP75559

LEGEND

| PROP. | | EXIST. |
|---|---|---|
| | WATERMAIN | |
| | STORM SEWER | |
| | SANITARY SEWER | |
| | GAS MAIN | |
| | ELECTRICAL DUCT | |
| | INLET/OUTLET HEADWALL | |
| | DITCH INLET/OUTLET | |
| | SWALE | |
| | EDGE OF PAVEMENT | |
| | VALVE BOX | |
| | LIMIT OF CONSTRUCTION | |
| | HYDRANT | |
| | ABOVE GROUND FLUSHOUT | |
| | BELOW GROUND FLUSHOUT | |
| | CATCHBASIN | |
| | DITCH INLET CATCHBASIN | |
| | MANHOLE | |
| | CLEANOUT | |
| | HYDRO POLE | |
| | CAP | |
| | STREETLIGHT | |
| | FENCE | |

NOTE:

ENGINEER'S SEAL

DESIGN: DB
DRAWN: JTD
PLOT DATE: 11-23-21
PRINT DATE:

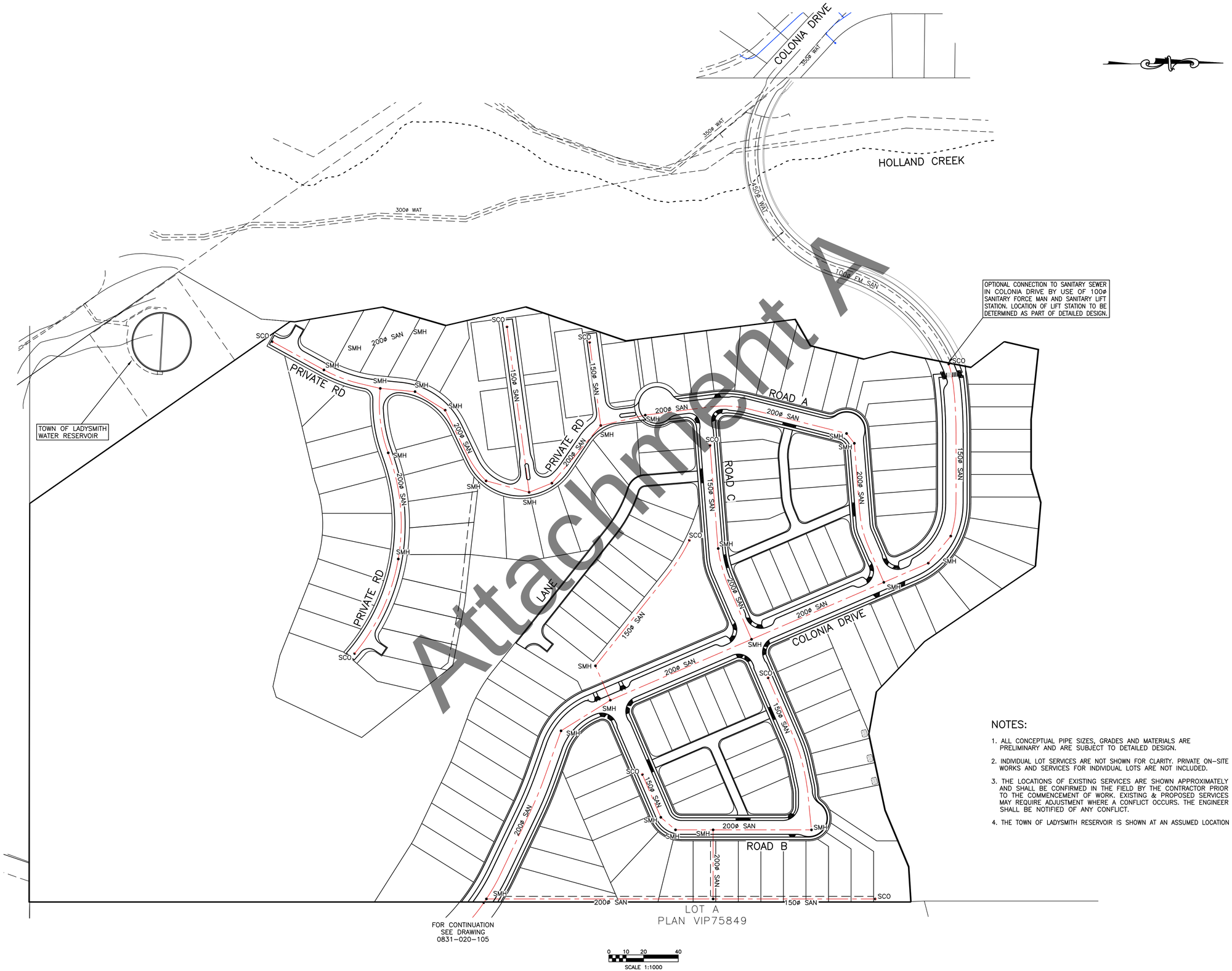
HORIZONTAL SCALE: 1:1000
VERTICAL SCALE:

CLIENT NAME

PROJECT NAME
ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE
PRELIMINARY WATER SERVICING PLAN

PROJECT No.: 0831-020
DRAWING No.: 102
REVISION No.: 01
CITY PLAN No.:






## NOTES:

1. ALL CONCEPTUAL PIPE SIZES, GRADES AND MATERIALS ARE PRELIMINARY AND ARE SUBJECT TO DETAILED DESIGN.
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4. THE TOWN OF LADYSMITH RESERVOIR IS SHOWN AT AN ASSUMED LOCATION

NEWCASTLE ENGINEERING LTD.
4–3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756–9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, VIP75559

LEGEND

| PROP. | | EXIST. |
|---|---|---|
| | WATERMAIN | |
| | STORM SEWER | |
| | SANITARY SEWER | |
| | GAS MAIN | |
| | ELECTRICAL DUCT | |
| | INLET/OUTLET HEADWALL | |
| | DITCH INLET/OUTLET | |
| | SWALE | |
| | EDGE OF PAVEMENT | |
| | VALVE BOX | |
| | LIMIT OF CONSTRUCTION | |
| | HYDRANT | |
| | ABOVE GROUND FLUSHOUT | |
| | BELOW GROUND FLUSHOUT | |
| | CATCHBASIN | |
| | DITCH INLET CATCHBASIN | |
| | MANHOLE | |
| | CLEANOUT | |
| | HYDRO POLE | |
| | CAP | |
| | STREETLIGHT | |
| | FENCE | |

NOTE:

| | |
|---|---|
| ENGINEER'S SEAL | DESIGN: DB |
| | DRAWN: JTD |
| | PLOT DATE: 11–23–21 |
| | PRINT DATE: |
| HORIZONTAL SCALE: 1:1000 | VERTICAL SCALE: |

CLIENT NAME

PROJECT NAME

ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE

PRELIMINARY SANITARY SERVICING PLAN

| | |
|---|---|
| PROJECT No.: 0831–020 | |
| DRAWING No.: 103 | REVISION No.: 01 |
| CITY PLAN No.: | |

## NOTES:

1. ALL CONCEPTUAL PIPE SIZES, GRADES AND MATERIALS ARE PRELIMINARY AND ARE SUBJECT TO DETAILED DESIGN.
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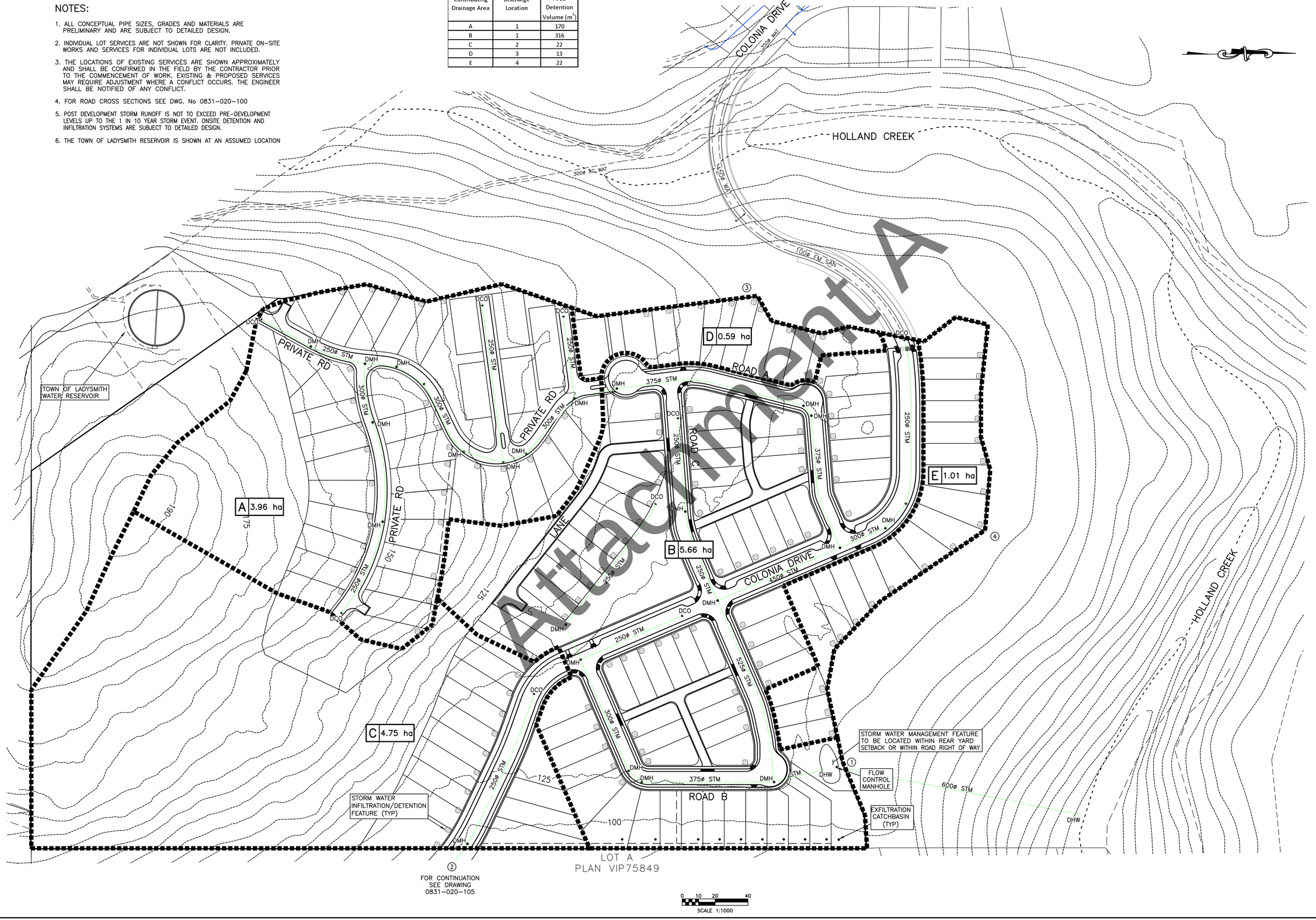
4. FOR ROAD CROSS SECTIONS SEE DWG. No 0831-020-100
5. POST DEVELOPMENT STORM RUNOFF IS NOT TO EXCEED PRE-DEVELOPMENT LEVELS UP TO THE 1 IN 10 YEAR STORM EVENT. ONSITE DETENTION AND INFILTRATION SYSTEMS ARE SUBJECT TO DETAILED DESIGN.
6. THE TOWN OF LADYSMITH RESERVOIR IS SHOWN AT AN ASSUMED LOCATION

| Contributing Drainage Area | Discharge Location | Drainage Area Detention Volume ($m^3$) |
|---|---|---|
| A | 1 | 170 |
| B | 1 | 316 |
| C | 2 | 22 |
| D | 3 | 13 |
| E | 4 | 22 |






NEWCASTLE ENGINEERING LTD.
4-3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756-9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW -NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, VIP75559

LEGEND

| PROP. | EXIST. |
|---|---|
| WATERMAIN | |
| STORM SEWER | |
| SANITARY SEWER | |
| GAS MAIN | |
| ELECTRICAL DUCT | |
| INLET/OUTLET HEADWALL | |
| DITCH INLET/OUTLET | |
| SWALE | |
| EDGE OF PAVEMENT | |
| VALVE BOX | |
| LIMIT OF CONSTRUCTION | |
| HYDRANT | |
| ABOVE GROUND FLUSHOUT | |
| BELOW GROUND FLUSHOUT | |
| CATCHBASIN | |
| DITCH INLET CATCHBASIN | |
| MANHOLE | |
| CLEANOUT | |
| HYDRO POLE | |
| CAP | |
| STREETLIGHT | |
| FENCE | |

NOTE:

ENGINEER'S SEAL

DESIGN: DB
DRAWN: JTD
PLOT DATE: 11-23-21
PRINT DATE:

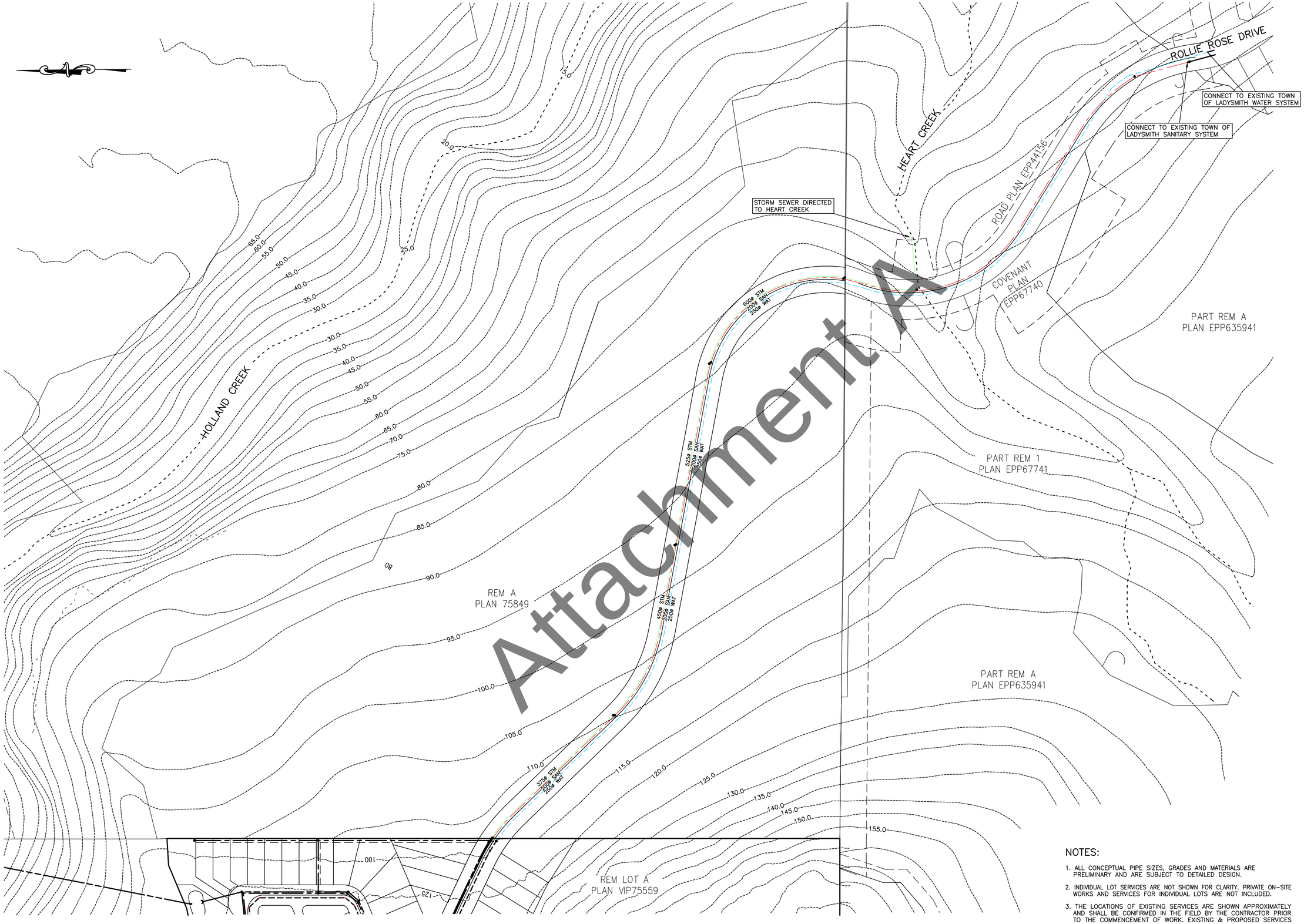
HORIZONTAL SCALE: 1:1000
VERTICAL SCALE:

CLIENT NAME

PROJECT NAME
ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE
PRELIMINARY STORM WATER SERVICING PLAN

PROJECT No. 0831-020
DRAWING No. 104
REVISION No. 01
CITY PLAN No.






## NOTES:

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NEWCASTLE ENGINEERING LTD.
4–3179 BARONS ROAD
NANAIMO, B.C. V9T 5W5
PHONE (250) 756–9553

| No. | DATE | REVISION DESCRIPTION |
|---|---|---|
| 00 | 06/29/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |
| 01 | 11/23/21 | SUBMITTED FOR REVIEW –NOT FOR CONSTRUCTION |

BENCHMARK DESCRIPTION

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM TOWN OF LADYSMITH LIDAR INFORMATION.

SITE LEGAL DESCRIPTION

REM. LOT 5, PLAN VIP75559

LEGEND

| PROP. | EXIST. |
|---|---|
| WATERMAIN | |
| STORM SEWER | |
| SANITARY SEWER | |
| GAS MAIN | |
| ELECTRICAL DUCT | |
| INLET/OUTLET HEADWALL | |
| DITCH INLET/OUTLET | |
| SWALE | |
| EDGE OF PAVEMENT | |
| VALVE BOX | |
| LIMIT OF CONSTRUCTION | |
| HYDRANT | |
| ABOVE GROUND FLUSHOUT | |
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| CATCHBASIN | |
| DITCH INLET CATCHBASIN | |
| MANHOLE | |
| CLEANOUT | |
| HYDRO POLE | |
| CAP | |
| STREETLIGHT | |
| FENCE | |

NOTE:

ENGINEER'S SEAL

| | |
|---|---|
| DESIGN | DB |
| DRAWN | bjh |
| PLOT DATE | 11-23-21 |
| PRINT DATE | |
| HORIZONTAL SCALE | 1:1000 |
| VERTICAL SCALE | |

CLIENT NAME

PROJECT NAME

# ARBUTUS NEIGHBOURHOOD
LADYSMITH, BC

DRAWING TITLE

# PRELIMINARY OFFSITE CONNECTION PLAN

| | |
|---|---|
| PROJECT No. | 0831–020 |
| DRAWING No. | 105 |
| REVISION No. | 00 |
| CITY PLAN No. | |

11.22.2021 P:\AUTOCAD\0800\0831-020 ELLER PROPERTY- LADYSMITH\0831-020 PLA REV01

Appendix 2

SANITARY SEWER FLOW ANALYSIS- CALCULATION SHEET

| | | | |
|---|---|---|---|
| PROJECT: | ARBUTUS NEIGHBOURHOOD | PROJECT #: 0831-020 | |
| ENGINEERING COMPANY: | NEWCASTLE ENGINEERING LTD. | DATE: 2021-11-24 | Mannings Formula |
| ADDRESS: | #4-3179 BARONS ROAD, NANAIMO | DESIGN: D. BEIDERWIEDEN | $V = (1/n) \times R^{2/3} \times S^{1/2}$ |
| ENGINEER: | DREW BEIDERWIEDEN | SHEET: __ OF __ | $Q = V \times A$ |
| | | | PVC n = 0.011 |
| | | | CONC. n = 0.013 |

| | | | | | | | Sewage Flow | | | Infiltration | | Total Flow | | Proposed or Existing Sewer | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Lots | Total Area | Proposed Units | Density (pph) | Density (ppl/ppu) | Equivalent Population | Cumulative Equivalent Population | Peak Flow AWWF (LPCPD) | Peak Flow (MLD) | Infiltration (MLD) | Cumulative Infiltration (MLD) | Total (MLD) | Flow (L/s) "Q" | Pipe Size (mm) "D" | Pipe Slope (%) "S" | Velocity (m/s) | Capacity (l/s) |
| Onsite | REM. LOT 5 Plan 75559 | 16.69 | 168 | 36 | 2.3 | 386 | 386 | 1628 | 0.629 | 0.187 | 0.187 | 0.816 | 9.4 | 200 | 0.50 | 0.87 | 27.409 |
| | | | | | | | | | | | | | | | | | |
| Offsite | Part Rem. A Plan EPP63594 | 17.37 | 176 | 36 | 2.3 | 405 | 791 | 1284 | 1.016 | 0.195 | 0.381 | 1.397 | 16.2 | 200 | 0.50 | 0.87 | 27.409 |
| | | | | | | | | | | | | | | | | | |
| Offsite | Rem. LOT A Plan 75849 | 44.83 | 610 | 50 | 2.3 | 1,403 | 2,194 | 905 | 1.985 | 0.502 | 0.884 | 2.869 | 33.2 | 250 | 0.50 | 1.01 | 49.695 |

Appendix 3

# STORM FLOW ANALYSIS - PRE-DEVELOPMENT CALCULATION SHEET

PROJECT: Arbutus Neighbourhood PROJECT #: 0831-020

ENGINEERING COMPA NEWCASTLE ENGINEERING LTD.

ADDRESS: #4-3179 BARONS ROAD, NANAIMO

ENGINEER: Drew Beiderwieden

DRAWING: 0831-020-104

SEAL/ENGINEER'S STAMP

RETURN PERIOD: 10 year

DATE: 2021-11-24

DESIGN BY: D. Beiderwieden

SHEET:

Mannings Formula

$V = (1/n) \times R^{2/3} \times S^{1/2}$

$Q = V \times A$

$n_{PVC}$ = 0.011

$n_{CONC}$ = 0.013

Rational Formula: Q=CxIxAx2.778

| Zone | Area (Ha) (A) | Coeff. ( C) | Area x Coeff. (AC) | Accum. AxC | Time of Concent. (min) | Rainfall Concent. (mm/hr) (I) | $Q_{100}$ (l/s) | Diam. (mm) (D) | Design Slope (%) (S) | Installed Slope (%) | Cap. (l/s) | Velocity (m/s) (V) | Length MH to MH (m) | Time of flow- MH to MH (min) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3.96 | 0.3 | 1.19 | 1.19 | 15.0 | 39.3 | 129.8 | | | | | | | |
| B | 5.66 | 0.3 | 1.70 | 1.70 | 15.0 | 39.3 | 185.5 | | | | | | | |
| C | 4.75 | 0.3 | 1.43 | 1.43 | 15.0 | 39.3 | 155.7 | | | | | | | |
| D | 0.59 | 0.3 | 0.18 | 0.18 | 10.0 | 49.2 | 24.2 | | | | | | | |
| E | 1.01 | 0.3 | 0.30 | 0.30 | 10.0 | 49.2 | 41.4 | | | | | | | |

# STORM FLOW ANALYSIS - POST-DEVELOPMENT CALCULATION SHEET

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT: | Arbutus Neighbourhood | | PROJECT #: 0831-020 | | | | | | | | RETURN PERIOD: 10 year | | | |
| ENGINEERING COMPA | NEWCASTLE ENGINEERING LTD. | | | | | | | | | | DATE: 2021-11-24 | | Mannings Formula | |
| ADDRESS: | #4-3179 BARONS ROAD, NANAIMO | | | | | | | | | | DESIGN BY: D. Beiderwieden | | $V = (1/n) \times R^{2/3} \times S^{1/2}$ | |
| ENGINEER: | Drew Beiderwieden | | | | | | | | | | SHEET: | | $Q = V \times A$ | |
| DRAWING: | 0831-020-104 | | | | | | | | | | | | $n_{PVC}$ = | 0.011 |
| | | | Rational Formula: Q=CxIxAx2.778 | | | | SEAL/ENGINEER'S STAMP | | | | | | $n_{CONC}$ = | 0.013 |
| Zone | Area (Ha) (A) | Coeff. ( C) | Area x Coeff. (AC) | Accum. AxC | Time of Concent. (min) | Rainfall Concent. (mm/hr) (I) | $Q_{100}$ (l/s) | Diam. (mm) (D) | Design Slope (%) (S) | Installed Slope (%) | Cap. (l/s) | Velocity (m/s) (V) | Length MH to MH (m) | Time of flow- MH to MH (min) |
| A | 3.96 | 0.60 | 2.38 | 2.38 | 15.0 | 39.3 | 259.6 | | | | | | | |
| B | 5.66 | 0.65 | 3.68 | 3.68 | 15.0 | 39.3 | 402.0 | | | | | | | |
| C | 4.75 | 0.40 | 1.90 | 1.90 | 15.0 | 39.3 | 207.6 | | | | | | | |
| D | 0.59 | 0.60 | 0.35 | 0.35 | 10.0 | 49.2 | 48.4 | | | | | | | |
| E | 1.01 | 0.60 | 0.61 | 0.61 | 10.0 | 49.2 | 82.8 | | | | | | | |

## PRELIMINARY DETENTION VOLUME CALCULATION
## METHOD: RATIONAL

| | | | |
|---|---|---|---|
| PROJECT: | Arbutus Neighborhood | PROJECT #: | 0831-020 |
| DESIGNER: | DREW BEIDERWIEDEN | ENGINEER: | Drew Beiderwieden |
| DRAWING: | 0831-020-105 | | |

TRIBUTARY AREAS: A

Detention Volume ($m^3$): 169.6

| Duration (min) | Rainfall Concentration (mm/hr) | $Q_{IN}$ (L/s) | Average $Q_{IN}$ (L/s) | $Q_{OUT}$ (L/s) | Volume Detained ($m^3$) | Cumulative Detention volume ($m^3$) |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 129.8 | 0 | 0.0 |
| 10 | 49.2 | 324.8 | 162.4 | 129.8 | 19.5 | 19.5 |
| 15 | 39.3 | 259.6 | 292.2 | 129.8 | 48.7 | 68.3 |
| 20 | 33.6 | 221.5 | 240.6 | 129.8 | 33.2 | 101.5 |
| 25 | 29.7 | 195.8 | 208.7 | 129.8 | 23.7 | 125.1 |
| 30 | 26.8 | 177.1 | 186.5 | 129.8 | 17.0 | 142.1 |
| 35 | 24.6 | 162.6 | 169.9 | 129.8 | 12.0 | 154.1 |
| 40 | 22.9 | 151.1 | 156.9 | 129.8 | 8.1 | 162.3 |
| 45 | 21.4 | 141.6 | 146.3 | 129.8 | 5.0 | 167.2 |
| 50 | 20.2 | 133.6 | 137.6 | 129.8 | 2.3 | 169.5 |
| 55 | 19.2 | 126.7 | 130.2 | 129.8 | 0.1 | 169.6 |
| 60 | 18.3 | 120.8 | 123.8 | 129.8 | -1.8 | 167.8 |
| 65 | 17.5 | 115.6 | 118.2 | 129.8 | -3.5 | 164.3 |
| 70 | 16.8 | 110.9 | 113.3 | 129.8 | -5.0 | 159.4 |
| 75 | 16.2 | 106.8 | 108.9 | 129.8 | -6.3 | 153.1 |
| 80 | 15.6 | 103.1 | 104.9 | 129.8 | -7.5 | 145.6 |
| 85 | 15.1 | 99.7 | 101.4 | 129.8 | -8.5 | 137.1 |
| 90 | 14.6 | 96.6 | 98.1 | 129.8 | -9.5 | 127.6 |
| 95 | 14.2 | 93.7 | 95.1 | 129.8 | -10.4 | 117.2 |
| 100 | 13.8 | 91.1 | 92.4 | 129.8 | -11.2 | 105.9 |
| 105 | 13.4 | 88.7 | 89.9 | 129.8 | -12.0 | 94.0 |
| 110 | 13.1 | 86.4 | 87.6 | 129.8 | -12.7 | 81.3 |
| 115 | 12.8 | 84.3 | 85.4 | 129.8 | -13.3 | 68.0 |

## PRELIMINARY DETENTION VOLUME CALCULATION
## METHOD: RATIONAL

| | | | |
|---|---|---|---|
| PROJECT: | Arbutus Neighborhood | PROJECT #: | 0831-020 |
| DESIGNER: | DREW BEIDERWIEDEN | ENGINEER: | Drew Beiderwieden |
| DRAWING: | 0831-020-105 | | |

TRIBUTARY AREAS: B

Detention Volume ($m^3$): 315.5

| Duration (min) | Rainfall Concentration (mm/hr) | $Q_{IN}$ (L/s) | Average $Q_{IN}$ (L/s) | $Q_{OUT}$ (L/s) | Volume Detained ($m^3$) | Cumulative Detention volume ($m^3$) |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 185.5 | 0 | 0.0 |
| 10 | 49.2 | 502.9 | 251.4 | 185.5 | 39.5 | 39.5 |
| 15 | 39.3 | 402.0 | 452.4 | 185.5 | 80.1 | 119.6 |
| 20 | 33.6 | 343.0 | 372.5 | 185.5 | 56.1 | 175.7 |
| 25 | 29.7 | 303.2 | 323.1 | 185.5 | 41.3 | 217.0 |
| 30 | 26.8 | 274.2 | 288.7 | 185.5 | 31.0 | 247.9 |
| 35 | 24.6 | 251.8 | 263.0 | 185.5 | 23.2 | 271.2 |
| 40 | 22.9 | 233.9 | 242.9 | 185.5 | 17.2 | 288.4 |
| 45 | 21.4 | 219.2 | 226.6 | 185.5 | 12.3 | 300.7 |
| 50 | 20.2 | 206.8 | 213.0 | 185.5 | 8.2 | 308.9 |
| 55 | 19.2 | 196.2 | 201.5 | 185.5 | 4.8 | 313.7 |
| 60 | 18.3 | 187.0 | 191.6 | 185.5 | 1.8 | 315.5 |
| 65 | 17.5 | 178.9 | 183.0 | 185.5 | -0.8 | 314.8 |
| 70 | 16.8 | 171.8 | 175.4 | 185.5 | -3.1 | 311.7 |
| 75 | 16.2 | 165.4 | 168.6 | 185.5 | -5.1 | 306.6 |
| 80 | 15.6 | 159.6 | 162.5 | 185.5 | -6.9 | 299.7 |
| 85 | 15.1 | 154.3 | 156.9 | 185.5 | -8.6 | 291.1 |
| 90 | 14.6 | 149.5 | 151.9 | 185.5 | -10.1 | 281.0 |
| 95 | 14.2 | 145.1 | 147.3 | 185.5 | -11.5 | 269.5 |
| 100 | 13.8 | 141.1 | 143.1 | 185.5 | -12.7 | 256.8 |
| 105 | 13.4 | 137.3 | 139.2 | 185.5 | -13.9 | 242.9 |
| 110 | 13.1 | 133.8 | 135.6 | 185.5 | -15.0 | 227.9 |
| 115 | 12.8 | 130.6 | 132.2 | 185.5 | -16.0 | 211.9 |
| 120 | 12.5 | 127.6 | 129.1 | 185.5 | -16.9 | 195.0 |
| 125 | 12.2 | 124.7 | 126.1 | 185.5 | -17.8 | 177.2 |
| 130 | 11.9 | 122.1 | 123.4 | 185.5 | -18.6 | 158.5 |
| 135 | 11.7 | 119.5 | 120.8 | 185.5 | -19.4 | 139.1 |
| 140 | 11.5 | 117.2 | 118.4 | 185.5 | -20.2 | 118.9 |
| 145 | 11.2 | 114.9 | 116.0 | 185.5 | -20.9 | 98.1 |
| 150 | 11.0 | 112.8 | 113.8 | 185.5 | -21.5 | 76.6 |
| 155 | 10.8 | 110.8 | 111.8 | 185.5 | -22.1 | 54.4 |
| 160 | 10.6 | 108.8 | 109.8 | 185.5 | -22.7 | 31.7 |
| 165 | 10.5 | 107.0 | 107.9 | 185.5 | -23.3 | 8.4 |
| 170 | 10.3 | 105.3 | 106.1 | 185.5 | -23.8 | -15.4 |

## PRELIMINARY DETENTION VOLUME CALCULATION
## METHOD: RATIONAL

| | | | |
|---|---|---|---|
| PROJECT: | Arbutus Neighborhood | PROJECT #: | 0831-020 |
| DESIGNER: | DREW BEIDERWIEDEN | ENGINEER: | Drew Beiderwieden |
| DRAWING: | 0831-020-105 | | |

TRIBUTARY AREAS: C

Detention Volume ($m^3$): 22.2

| Duration (min) | Rainfall Concentration (mm/hr) | $Q_{IN}$ (L/s) | Average $Q_{IN}$ (L/s) | $Q_{OUT}$ (L/s) | Volume Detained ($m^3$) | Cumulative Detention volume ($m^3$) |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 155.7 | 0 | 0.0 |
| 10 | 49.2 | 259.7 | 129.9 | 155.7 | -15.5 | -15.5 |
| 15 | 39.3 | 207.6 | 233.7 | 155.7 | 23.4 | 7.9 |
| 20 | 33.6 | 177.1 | 192.4 | 155.7 | 11.0 | 18.9 |
| 25 | 29.7 | 156.6 | 166.9 | 155.7 | 3.3 | 22.2 |
| 30 | 26.8 | 141.6 | 149.1 | 155.7 | -2.0 | 20.2 |
| 35 | 24.6 | 130.1 | 135.8 | 155.7 | -6.0 | 14.3 |
| 40 | 22.9 | 120.8 | 125.4 | 155.7 | -9.1 | 5.2 |
| 45 | 21.4 | 113.2 | 117.0 | 155.7 | -11.6 | -6.4 |
| 50 | 20.2 | 106.8 | 110.0 | 155.7 | -13.7 | -20.1 |
| 55 | 19.2 | 101.3 | 104.1 | 155.7 | -15.5 | -35.6 |
| 60 | 18.3 | 96.6 | 99.0 | 155.7 | -17.0 | -52.7 |

## PRELIMINARY DETENTION VOLUME CALCULATION
## METHOD: RATIONAL

| | | | |
|---|---|---|---|
| PROJECT: | Arbutus Neighborhood | PROJECT #: | 0831-020 |
| DESIGNER: | DREW BEIDERWIEDEN | ENGINEER: | Drew Beiderwieden |
| DRAWING: | 0831-020-105 | | |

TRIBUTARY AREAS: D

Detention Volume ($m^3$): 12.8

| Duration (min) | Rainfall Concentration (mm/hr) | $Q_{IN}$ (L/s) | Average $Q_{IN}$ (L/s) | $Q_{OUT}$ (L/s) | Volume Detained ($m^3$) | Cumulative Detention volume ($m^3$) |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 24.2 | 0 | 0.0 |
| 10 | 49.2 | 48.4 | 24.2 | 24.2 | 0.0 | 0.0 |
| 15 | 39.3 | 38.7 | 43.5 | 24.2 | 5.8 | 5.8 |
| 20 | 33.6 | 33.0 | 35.8 | 24.2 | 3.5 | 9.3 |
| 25 | 29.7 | 29.2 | 31.1 | 24.2 | 2.1 | 11.4 |
| 30 | 26.8 | 26.4 | 27.8 | 24.2 | 1.1 | 12.4 |
| 35 | 24.6 | 24.2 | 25.3 | 24.2 | 0.3 | 12.8 |
| 40 | 22.9 | 22.5 | 23.4 | 24.2 | -0.2 | 12.5 |
| 45 | 21.4 | 21.1 | 21.8 | 24.2 | -0.7 | 11.8 |
| 50 | 20.2 | 19.9 | 20.5 | 24.2 | -1.1 | 10.7 |
| 55 | 19.2 | 18.9 | 19.4 | 24.2 | -1.4 | 9.3 |
| 60 | 18.3 | 18.0 | 18.4 | 24.2 | -1.7 | 7.5 |
| 65 | 17.5 | 17.2 | 17.6 | 24.2 | -2.0 | 5.6 |
| 70 | 16.8 | 16.5 | 16.9 | 24.2 | -2.2 | 3.4 |
| 75 | 16.2 | 15.9 | 16.2 | 24.2 | -2.4 | 1.0 |
| 80 | 15.6 | 15.4 | 15.6 | 24.2 | -2.6 | -1.6 |

## PRELIMINARY DETENTION VOLUME CALCULATION
## METHOD: RATIONAL

| | | | |
|---|---|---|---|
| PROJECT: | Arbutus Neighborhood | PROJECT #: | 0831-020 |
| DESIGNER: | DREW BEIDERWIEDEN | ENGINEER: | Drew Beiderwieden |
| DRAWING: | 0831-020-105 | | |

TRIBUTARY AREAS: E

Detention Volume ($m^3$): 21.9

| Duration (min) | Rainfall Concentration (mm/hr) | $Q_{IN}$ (L/s) | Average $Q_{IN}$ (L/s) | $Q_{OUT}$ (L/s) | Volume Detained ($m^3$) | Cumulative Detention volume ($m^3$) |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 41.4 | 0 | 0.0 |
| 10 | 49.2 | 82.8 | 41.4 | 41.4 | 0.0 | 0.0 |
| 15 | 39.3 | 66.2 | 74.5 | 41.4 | 9.9 | 9.9 |
| 20 | 33.6 | 56.5 | 61.4 | 41.4 | 6.0 | 15.9 |
| 25 | 29.7 | 49.9 | 53.2 | 41.4 | 3.5 | 19.5 |
| 30 | 26.8 | 45.2 | 47.6 | 41.4 | 1.8 | 21.3 |
| 35 | 24.6 | 41.5 | 43.3 | 41.4 | 0.6 | 21.9 |
| 40 | 22.9 | 38.5 | 40.0 | 41.4 | -0.4 | 21.5 |
| 45 | 21.4 | 36.1 | 37.3 | 41.4 | -1.2 | 20.2 |
| 50 | 20.2 | 34.1 | 35.1 | 41.4 | -1.9 | 18.3 |
| 55 | 19.2 | 32.3 | 33.2 | 41.4 | -2.5 | 15.9 |
| 60 | 18.3 | 30.8 | 31.6 | 41.4 | -3.0 | 12.9 |
| 65 | 17.5 | 29.5 | 30.1 | 41.4 | -3.4 | 9.5 |
| 70 | 16.8 | 28.3 | 28.9 | 41.4 | -3.8 | 5.8 |
| 75 | 16.2 | 27.2 | 27.8 | 41.4 | -4.1 | 1.7 |
| 80 | 15.6 | 26.3 | 26.8 | 41.4 | -4.4 | -2.7 |



# ENVIRONMENTAL ASSESSMENT

## FOR PROPOSED HOLLAND HEIGHTS NEIGHBOURHOOD DEVELEOPMENT PERMIT AREA 11



PREPARED FOR:
LAMONT LAND
200-5716 1ST STREET SE
CALGARY AB T2H 1H8

AND

THE TOWN OF LADYSMITH
PO BOX 222
LADYSMITH BC V9G 1A2

CORVIDAE PROJECT #2020-064
JANUARY 2022

CORVIDAE
ENVIRONMENTAL CONSULTING INC
6526 WATER STREET, SOOKE, BC

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## CAVEAT

This Environmental Assessment (EA) has been prepared with the best information available at the time of writing, including the Holland Creek Area Plan, communications with the client and regulators, site visits, review of site plans and design drawings and other documentation relevant to the project. This EA has been developed to assist the project in remaining in compliance with relevant environmental regulations, acts and laws pertaining to the project and to identify and mitigate the expected impacts of the project and reclamation activities directly related to the project.

# 1 INTRODUCTION

Corvidae Environmental Consulting Inc. (Corvidae) is pleased to provide this Environmental Assessment (EA) for the proposed Holland Heights Neighbourhood within the Town of Ladysmith, BC. The neighbourhood is planned within an undeveloped portion of the ***Holland Creek Area Plan***. The property is 17.6 ha, currently zoned as R-1 Single Dwelling Residential, and is located adjacent to Development Permit Area (DPA 11) – Arbutus Hump ESA as indicated on Map 2 of the ***Town of Ladysmith Official Community Plan (OCP).***

This report addresses the requirements in Section 3 of the ***Town of Ladysmith OCP of Bylaw No. 1488 (2003)*** and ***Schedule C – the Holland Creek Area Plan (2016)*** and provides an assessment on the environmental conditions on the property, potential impacts of the proposed development, and recommendations on the protection of environmentally sensitive features and methods to minimize impacts.

The Arbutus Hump area extends across approximately 5.2 ha (29% parcel areas) and composed of undulating second growth forests with rocky outcrops throughout (Figure 1). The area is sloped to the north, east, south and west. Only areas with slopes less than 30% are proposed to be developed and have been identified in a geotechnical report that will be provided as a separate document for a portion of the lands. Lamont plans for a strata residential neighbourhood, composed of 168 homes and access streets north of the DPA 11 area. There will be no home construction within the Arbutus Hump – DPA 11 area. However, low impact trail network will be created which will connect to the existing trail network in the Holland Creek Area. Efforts will be made to enhance and protect the area by removing the large amount of invasive scotch broom observed, protecting areas with slopes greater than 30% and creating buffer zones between infrastructure and the leading edge of the woodland to reduce windfall of trees from development, as recommended by the Arborist. An illustrative neighbourhood plan is provided as Figure 3. Multiple revisions of the development plan have been completed by Lamont Land to ensure that the environmental integrity of DPA 11 is maintained.

The purpose of this EA is to assess the potential effects of the project on the environment by identifying terrestrial habitat, sensitive ecosystems, and habitat features such as wildlife trees, animal burrows and hibernaculum. This EA also identifies the potential occurrence of threatened or endangered species and ecosystems within and adjacent to the project. Following the detailed assessment and documentation of biophysical features, this EA provides the environmental protection measures for the proposed development.




Community Context Plan

**Legend**

Trail | Creek | Site Boundary | Municipal Boundary

0 250 500 1,000 1,500 Meters

Project: Arbutus Hump DPA

Sources: Capital Regional District, DataBC

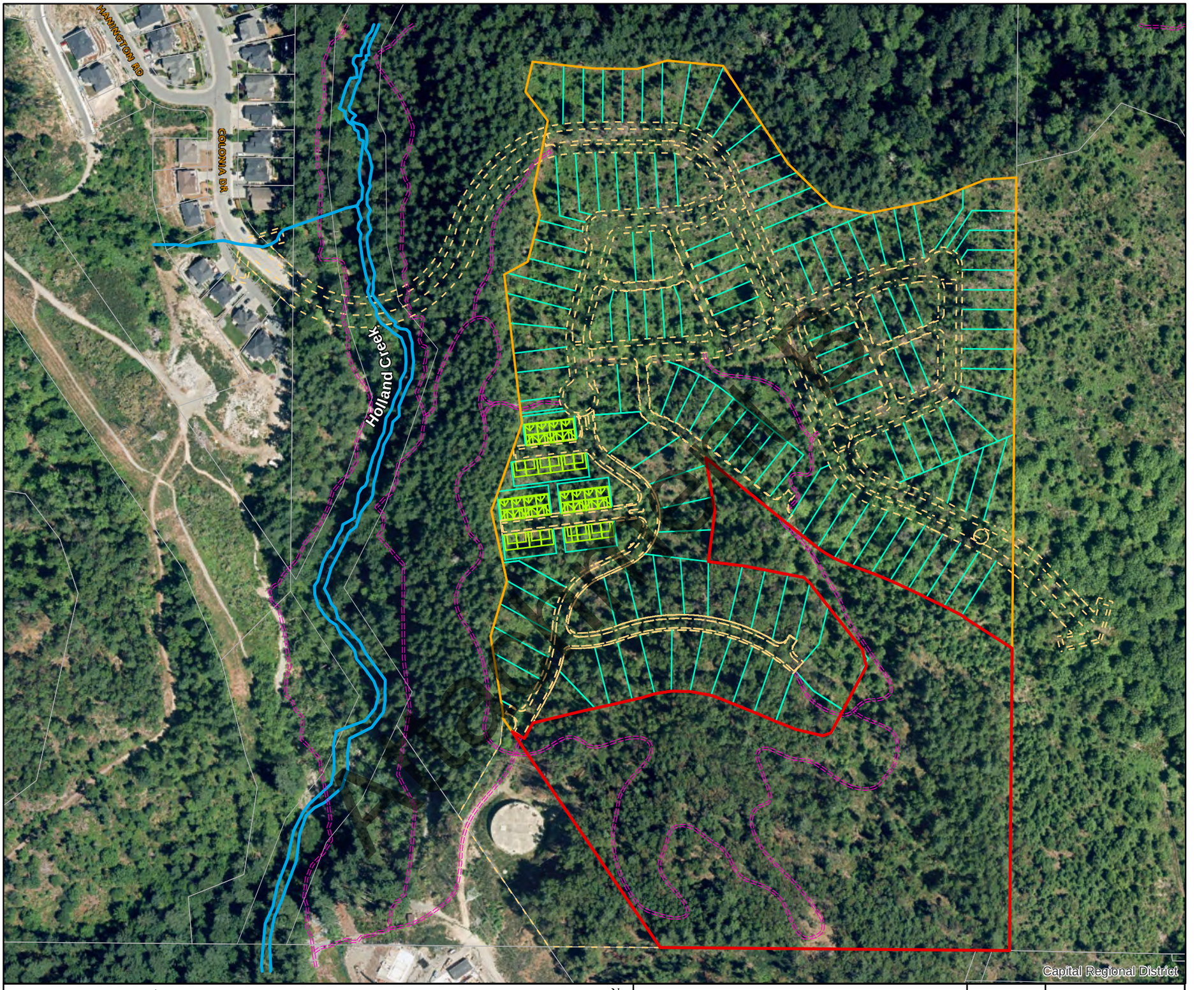
N

CORVIDAE ENVIRONMENTAL CONSULTING INC

| Rev. # | Date |
|---|---|
| 0 | July 6, 2021 |
| | |
| | |

Corvidae Project No.
COR-2020-064

**Figure 1**




Project Location and DPA 11

New building to be constructed
Site Boundary
Trail
Creek
Strata Lot
New roads to be constructed
DPA11

N

0 50 100 200 300 Meters

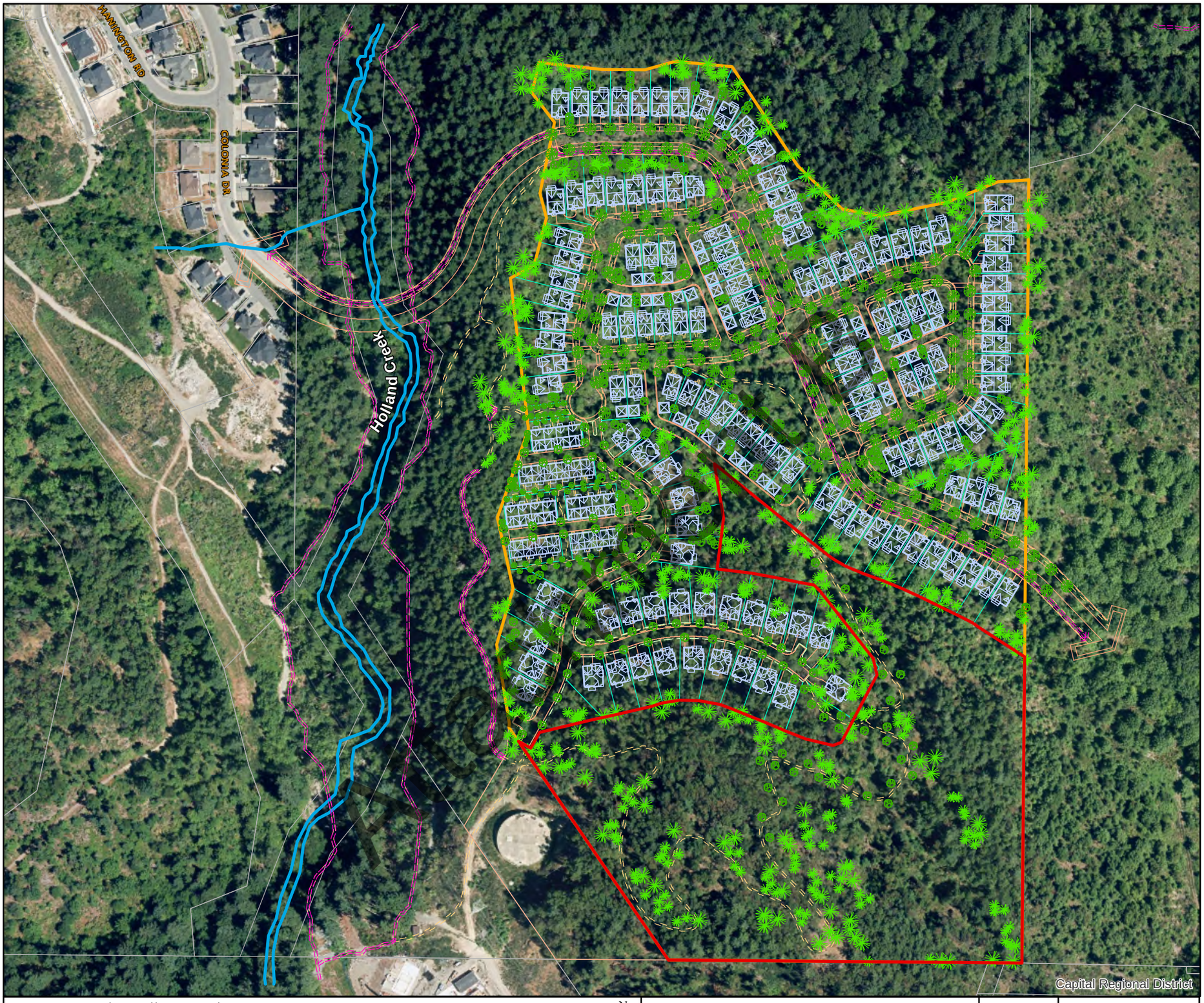
Project: Arbutus Hump DPA | Sources: Capital Regional District, DataBC

CORVIDAE ENVIRONMENTAL CONSULTING INC

| Rev. # | Date |
|---|---|
| 0 | June 22, 2021 |
| 1 | January 6, 2022 |
| | |

Corvidae Project No.
COR-2020-064

**Figure 2**




New Design Plan - Illustrated Concept

N

New Building
Site Boundary
Trail
Creek
Lot LUC
New roads to be constructed
Sidewalk
Road Strata
Tree
Tree Streetline
DPA11

0 50 100 200 300 Meters

Project: Arbutus Hump DPA | Sources: Capital Regional District, DataBC

CORVIDAE ENVIRONMENTAL CONSULTING INC

| Rev. # | Date |
|---|---|
| 0 | June 22, 2021 |
| 1 | January 6, 2022 |
| | |

Corvidae Project No.
COR-2020-064

**Figure 3**

## 1.1 REGULATORY FRAMEWORK

This environmental assessment is designed to comply with the provisions set out in the Holland Creek Area Plan – Schedule C and Town of Ladysmith Official Community Plan (OCP) for development permit areas and for compliance with the provisions for environmental protection contained in the following relevant legislation:

**Municipal**

- *Holland Creek Local Area Plan – Schedule C of Bylaw No.1488*

  *4.2.10 Give special consideration to Arbutus Hump by protecting the top of Arbutus Hump, encouraging recreational uses, and limiting development.*

  *5.1.4 Protect Arbutus Hump as a special natural feature and viewscape.*

  *10.2.4 The location of a new neighbourhood reservoir may be suitable at an elevation below the highest elevation of the Arbutus Hump summit. The siting evaluation criteria shall include biophysical environmental site information, site design that mitigates view impacts, and the opportunity to utilize the facility within a future park site or other amenity for the public. A tower design is not supported.*

  *Development Permit Areas:*

  *The Development Permit Areas (DPA) that apply in the Plan Area are shown on OCP Map 2 – Development Permit Areas. The special conditions, objectives and guidelines for the following Development Permit Areas that apply in the Plan Area are contained in OCP Schedule A.1* [Town of Ladysmith OCP].

The guiding principle for the use of Development Permits is found within the Local Government Act. Development Permit Areas can be designated for purposes such as, but not limited to the following:

- Protects, enhances and restores the biodiversity and ecological values and functions of environmentally sensitive areas.
- Fosters compatibility between development, existing land uses and environmentally sensitive areas.
- Maintains connectivity between sensitive ecosystems; and
- Protects water quality and quantity.

**Provincial**

- *Wildlife Act* (1996)
- Invasive Species Council of BC
- *Weed Control Act* (1996, current as of October 2016)
- Riparian Areas Protection Regulation (2019)

**Federal**

- *Migratory Birds Convention Act (*1994)
- *Species at Risk Act (SARA) (2002)*

# 2 SCOPE OF WORK

Corvidae completed the EA for the property, documenting the ecological features on the property including Arbutus Hump (DPA 11) and steep slope areas. Background information was reviewed, including applicable databases. During the assessment, the following features were documented in this report:

- Areas of sensitivity, habitat and biodiversity values;
- Plant communities and plant species on site;
- Potential wildlife presence and wildlife habitat;
- Soil types and properties;
- Terrain; and
- Surface water flow patterns.

Following the field assessment, the biophysical features and existing and proposed cleared areas were mapped and buffer areas identified. Mitigations to minimize the impacts of the proposed residential development on the environment have been provided in Section 6.

# 3 METHODS

## 3.1 DESKTOP REVIEW

Baseline biophysical conditions were compiled by reviewing the best available data and information including existing reports for the area and online provincial and federal databases:

- BC Conservation Data Centre (BC CDC 2021a and 2021b);
- BC HabitatWizard (Province of BC 2021);
- Aerial photographs of the property (Google Earth 2021);
- Holland Creek Local Area Plan Bylaw No. 1488 (ToL 2016).

## 3.2 FIELD ASSESSMENT

A field assessment of the property was completed by Qualified Environmental Professionals (QEPs) from Corvidae. The assessment included characterization of vegetation and habitat types, wildlife sign and species observations, wildlife habitat, and assessed the current conditions of the property.

# 4 ENVIRONMENTAL SITE ASSESSMENT

Corvidae completed a site visit on May 18 and September 8, 2021. Appendix A shows photos of the property and the sensitive Arbutus Hump DPA area. Areas mapped during the site assessment are detailed on Figure 1 and Figure 5.

## 4.1 CLIMATE AND BIOGEOCLIMATIC ZONE

The project is located in the Coastal Western Hemlock Very Dry Maritime Subzone (CWHxm1). The CWHxm1 occurs at lower elevations along the coast of Vancouver Island (above the CDF where present) at typical elevations of 150 m to 450 m above sea level. The CWHxm1 has warm, dry summers and moist, mild winters with relatively little snowfall. Growing seasons are long, and feature water deficits in the summer months (Green and Klinka 1994).

## 4.2 TERRAIN AND SOILS

Soils in the CWHxm1 are typically classified as Orthic Dystric Brunisols. The soil texture is sandy loam with 30-60% coarse fragments including gravel and cobble. Soils are well drained, and often less than 1m thick over extrusive bedrock (Jungen 1985).

The development area had shallow soils with areas of exposed bedrock throughout. The area has 70% RUMSLEY soil, being well drained and silty loam in texture, and 30% SHAWNIGAN soil, being moderately well drained and loam in texture.

The center of Arbutus Hump is situated at the top of a peak with slopes to the north, east, south and west. The surface topography of the surrounding slopes is undulating, with the steepest slopes found along the eastern boundary of the DPA area. A geotechnical report was completed outlining the best area to develop the lots. It was determined that the central-east portion of the DPA would be developed as it will have the least impact to slope stability, refer to the geotechnical report for details.

A new roadway has been constructed adjacent to the eastern boundary of DPA 11 and the bottom of the slope. There are also remnants of old logging roads found throughout the area.

## 4.3 VEGETATION

Coniferous forests in the CWHxm1 zone are dominated by Douglas-fir, western hemlock and western redcedar. Understory species include salal, dull Oregon-grape, red huckleberry, vanilla-leaf, sword fern, twinflower, and bracken, step moss, and Oregon beaked moss (Green and Klinka 1994).

The Douglas-fir / Arbutus ecosystem is a red-listed ecological community that was identified throughout the development area. Arbutus and Douglas-fir dominate the canopy occupying approximately 80% of the tree cover. The understory vegetation was dense, ranging from 40% cover in areas to 80% in others. The understory vegetation was diverse but dominated by ocean spray, salal, baldhip rose, and dull Oregon grape. See Section 4.5 for more details on this ecosystem.

The area is second growth forest with the exception of the peak of Arbutus Hump; it was confirmed by the arborist that the peak of Arbutus Hump was retained during historic logging. Additionally, they noted that western red cedar and western hemlock were planted in the area and do represent the vegetation that occur within the ecological community.

Scotch broom has infested the entire DPA area, however, the densities of broom are the highest in the southern half of the area.

During the site assessment the species in Table 1 were found on the site.

**Table 1. Plant species observed on site during field visit on May 18 and September 8, 2021**

| Common Name | Scientific Name | BC Provincial Status[1] | *SARA* Schedule 1 Status[2] |
|---|---|---|---|
| Arbutus | *Arbutus menziesii* | Yellow | -- |
| Baldhip rose | *Rosa gymnocarpa* | Yellow | -- |
| Bigleaf maple | *Acer macrophyllum* | Yellow | -- |
| Bitter cherry | *Prunus emarginata* | Yellow | -- |
| Black hawthorn | *Crataegus douglasii* | Yellow | -- |
| Bracken fern | *Pteridium aquilinum* | Yellow | -- |
| Broad-leaved starflower | *Lysimachia latifolia* | Yellow | -- |
| Cleavers | *Galium aparine* | Yellow | -- |
| Common foxglove | *Digitalis purpurea* | Exotic | -- |
| Douglas-fir | *Pseudotsuga menziesii* | Yellow | -- |
| Dull Oregon-grape | *Berberis nervosa* | Yellow | -- |
| English holly | *Ilex aquifolium* | Exotic | -- |
| Electrified cat's-tail moss | *Rhytidiadelphus triquetrus* | Yellow | -- |
| Hairy manzanita | *Arctostaphylos columbiana* | Yellow | -- |
| Haircap moss sp. | *Polytrichum spp.* | -- | -- |
| Licorice fern | *Polypodium glycyrrhiza* | Yellow | -- |
| Ocean spray | *Holodiscus discolor* | Yellow | -- |
| Oregon beaked moss | *Eurhynchium oreganum* | Yellow | -- |
| Oxeye daisy | *Leucanthemum vulgare* | Exotic | -- |
| Rattlesnake-plantain | *Goodyera oblongifolia* | Yellow | -- |
| Red huckleberry | *Vaccinium parvifolium* | Yellow | -- |
| Salal | *Gaultheria shallon* | Yellow | -- |
| Saskatoon | *Amelanchier alnifolia* | Yellow | -- |
| Scotch broom | *Cytisus scoparius* | Exotic | -- |
| Step moss | Hylocomium splendens | Yellow | -- |
| Sweet vernal grass | *Anthoxanthum odoratum* | Exotic | -- |
| Sword fern | *Polystichum munitum* | Yellow | -- |
| Tall Oregon grape | *Mahonia aquifolium* | Yellow | -- |
| Trailing blackberry | *Rubus ursinus* | Yellow | -- |
| Trailing snowberry | *Symphoricarpos hesperius* | Yellow | -- |
| Vanilla-leaf | *Achlys triphylla* | Yellow | -- |
| Wall lettuce | *Mycelis muralis* | Yellow | -- |
| Western flowering dogwood | *Cornus nuttallii* | Yellow | -- |
| Western hemlock | *Tsuga heterophylla* | Yellow | -- |
| Western redcedar | *Thuja plicata* | Yellow | -- |

[1] BC CDC 2021a

[2] Government of Canada 2021

## 4.4 WILDLIFE

The forested habitat is found in the Coastal Western Hemlock biogeoclimatic zone is home to many wildlife species. Black-tailed deer, black bear, marten and gray wolf are the most common large mammals in this zone on Vancouver Island. For bird species in this zone, the following typically occur: great horned owl, barred owl, ruffed grouse, band-tailed pigeon, northern flicker, hairy woodpecker, common raven, Steller's jay, chestnut-backed chickadee, red-breasted nuthatch, varied thrush, red-tailed hawk, and Townsend's warbler. The following amphibians may occur in this biogeoclimatic zone: western toad, Pacific treefrog, and western redbacked salamander (Pojar et al. 1991).

There were few wildlife trees observed throughout the DPA area, primarily in the area to remain. These tree's had woodpecker sign and many cavities that appeared to be vacant at the time of the assessment. No nests were observed; however, a good deal of bird activity was observed throughout the property.

The rocky slopes descending from the top of Arbutus Hump provide good habitat for snakes and lizards. None were observed during the site visit.

During the site assessment the species in Table 2 were found on the site.

**Table 2. Wildlife Species observed on site during field visit on May 18 and September 8`, 2021**

| Common Name | Scientific Name | BC Provincial Status[1] | *SARA* Schedule 1 Status[2] |
|---|---|---|---|
| Black-tailed deer (scat) | *Odocoileus hemionus* | Yellow | -- |
| Brown creeper | *Certhia americana* | Yellow | -- |
| California Quail | *Callipepla californica* | Exotic | -- |
| Cassin's Vireo | *Vireo cassinii* | Yellow | -- |
| Chipping Sparrow | *Spizella passerina* | Yellow | -- |
| Dark-eyed Junco | *Junco hyemalis* | Yellow | -- |
| MacGillivray's Warbler | *Geothlypis tolmiei* | Yellow | -- |
| Northern Flicker | *Colaptes auratus* | Yellow | -- |
| Olive-sided Flycatcher | *Contopus cooperi* | Blue | -- |
| Spotted Towhee | *Pipilo maculatus* | Yellow | -- |
| Red breasted nuthatch | *Sitta canadensis* | Yellow | -- |
| Ruffed Grouse | *Bonasa umbellus* | Yellow | -- |
| Rufous Hummingbird | *Selasphorus rufus* | Yellow | -- |
| White crowned sparrow | *Zonotrichia leucophrys* | Yellow | -- |

[1] BC CDC 2021a

[2] Government of Canada 2021



## 4.5 SPECIES AT RISK

A query of the BC CDC iMap tool yielded occurrences of 2 species at risk and 1 ecosystem at risk within a two-kilometer radius of the property (BC CDC 2021b). Species are listed in Table 3 and the location of occurrences in relation to the property is provided in Figure 4.

**Table 3. Species at risk that may occur in the vicinity of Holland Heights Subdivision**

| Occurrence ID | Common Name | Scientific Name | BC Provincial Status[1] | *SARA* Schedule 1 Status[2] |
|---|---|---|---|---|
| **Species at risk** | | | | |
| 12743 | Great Blue Heron, fannini subspecies | Ardea herodias fannini | Blue | Special Concern |
| 4551 | Purple Martin | Progne subis | Blue | -- |
| **Ecosystems at risk** | | | | |
| 14108/ 14106 | grand fir / dull Oregon-grape | Pseudotsuga menziesii / Berberis nervosa | Red | -- |

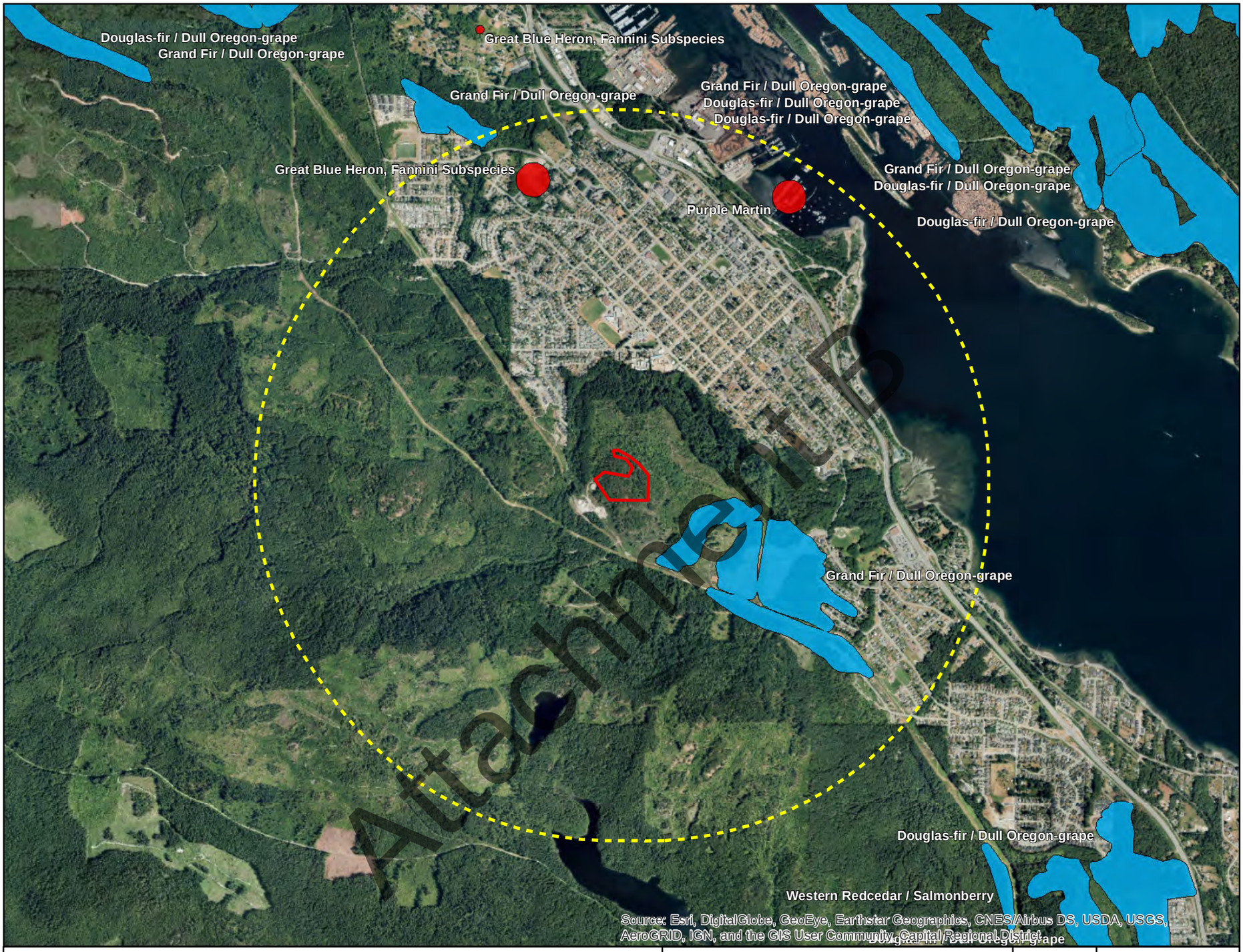
[1] BC CDC 2021a
[2] Government of Canada 2021

Douglas-fir / Arbutus is a red-listed ecological community that did not have a mapped occurrence within a 2 km radius. This ecological community was, however, observed on the property. This ecosystem is described as having a tree layer (40-90% cover) is dominated by Pseudotsuga menziesii (Douglas-fir) and Arbutus menziesii (arbutus). The shrub layer is highly variable (5-85% total cover) within and between stands. The shrub layer is generally poorly developed on sites with limited soil development. However, when the shrub layer is well-developed, commonly occurring shrubs include Holodiscus discolor (ocean-spray), Mahonia nervosa (dull Oregon-grape). Other shrubs may include some of the following: Symphoricarpos albus (snowberry), Mahonia aquifolium (tall Oregon-grape), Rosa gymnocarpa (bald-hip rose), Amelanchier alnifolia (saskatoon), Rubus ursinus (trailing blackberry), Gaultheria shallon (salal), and Lonicera hispidula (hairy honeysuckle). Within the open woodland, the herb layer that is highly variable in coverage (5 - 95%). Herbs are generally low in cover and include a mixture of grasses. Other species include Moehringia macrophylla (big-leaved sandwort), Lathyrus nevadenis (purple peavine), Erythronium oregonum (white fawn lily), Trientalis latifolia (starflower), Pteridium aquilinum (bracken) among others. The moss layer is variable (1-40% cover) and tends towards higher percentages of cover on outcropping bedrock where woody plants are unable to establish. Most commonly encountered bryophyte species include Rhytidiadelphus triquetrus (electrified cat's-tail moss), Hylocomium splendens (step moss), Dicranum scoparium (broom moss), Racomitriumcanescens (greyrockmoss), Selaginellawallacei (Wallace's selaginella), Leucolepis menziesii (Menzies' tree-moss), Eurhynchium oreganum (Oregon beaked-moss), and Eurhynchium praelongum (slender beaked-moss) (B.C. Conservation Data Centre 2021). These species were observed throughout the development areas. Additional species that were also identified that are not associated with the ecosystem such as: western hemlock, western redcedar, and large amounts of scotch broom. These species were either planted or introduced to the area. Figure 5 shows the extent of the listed habitat and the area of extremely dense scotch broom. Scotch broom was identified throughout the entire ecosystem, with densities decreasing to the north.

Lamont Land intends to develop a portion of the ecosystem as seen in Figure 5. However, the majority of the ecosystem is being retained and enhanced as the entire DPA 11 area is not to be developed.

## CRITICAL HABITAT

No critical habitat was identified for the development after completing a search on CDC iMap (2021).






CDC Species at Risk

**Legend**

- DPA 11
- 2 km buffer around project boundary
- Ecological Community
- Vertebrate Animal

N

0 500 1,000 2,000 Meters

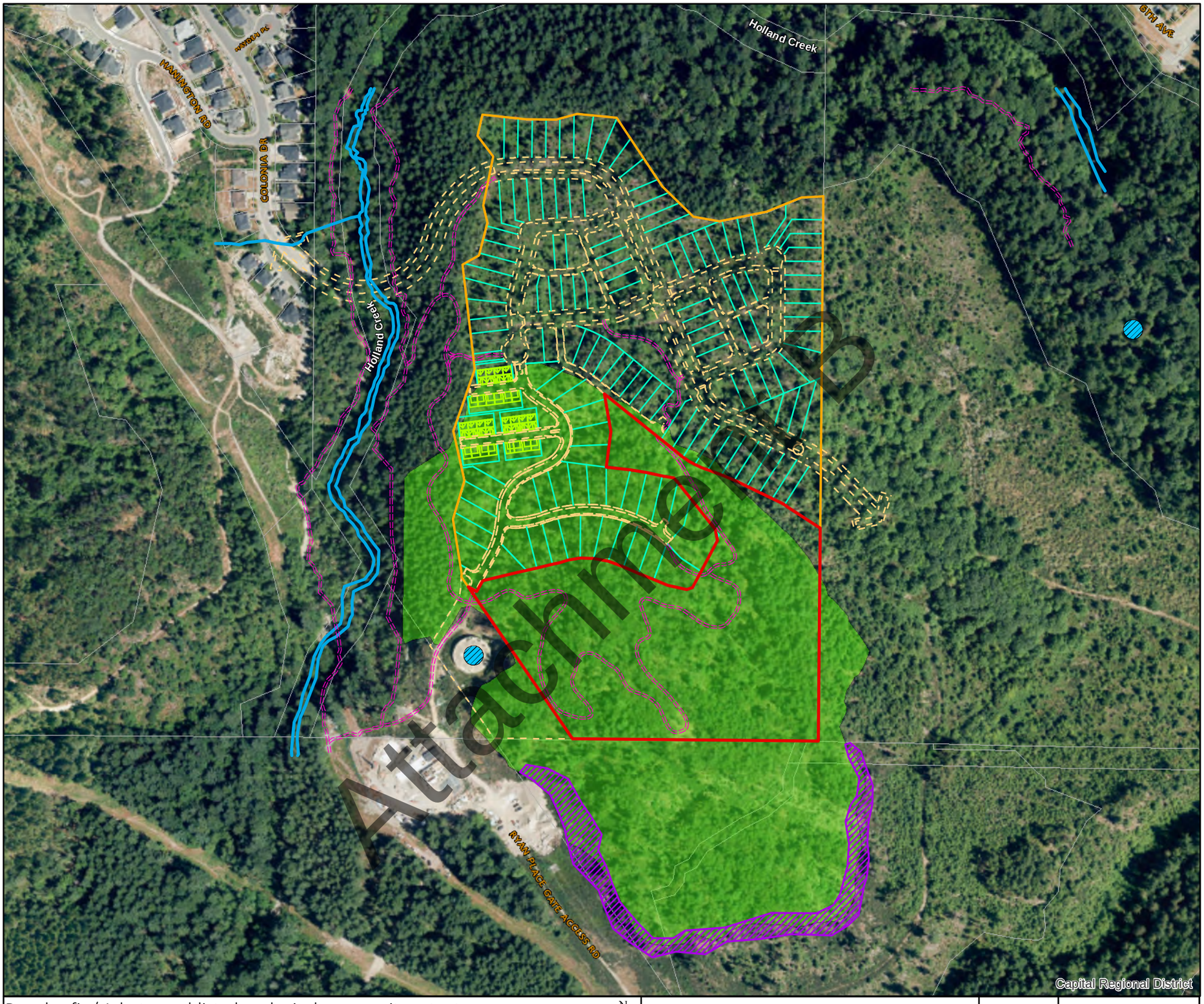
Project: Arbutus Hump DPA
Sources: Capital Regional District, DataBC

CORVIDAE ENVIRONMENTAL CONSULTING INC

| Rev. # | Date |
|---|---|
| 0 | June 22, 2021 |
| | |
| | |

Corvidae Project No.
COR-2021-064

**Figure 4**






Douglas-fir / Arbutus red-listed ecological community extent

Reservoir
New building to be constructed
Site Boundary
Trail
Creek
Strata Lot
New roads to be constructed
DPA11
Area of exretmely dense scoth broom
Listed doug fir - arbutus ecosystem polygon

N

0 50 100 200 300 Meters

Project: Arbutus Hump DPA | Sources: Capital Regional District, DataBC

CORVIDAE ENVIRONMENTAL CONSULTING INC

| Rev. # | Date |
|---|---|
| 0 | June 22, 2021 |
| 1 | January 4, 2022 |
| | |

Corvidae Project No.
COR-2020-064

**Figure 5**

## 4.6 ABORIST TREE MANAGEMENT REPORT

Bartlett Tree Experts were asked to visit the Arbutus Hump site, assess the trees within the project area, comment on the condition of the tree stock, and make recommendations for future management. They identified Arbutus, Douglas fir, Western red cedar and Western hemlock to be the tree species represented on the site. They noted that overall, the trees were in good health and that the western redcedar and western hemlock had been planted approximately 20 years ago and were introduced to the area. The arborist also recommended creating buffer zones between infrastructure and the leading edge of the woodland where larger trees that are more likely to fail are removed at the start of the project and before targets are introduced. These areas can be allowed to become tree covered over time through natural regeneration and planting as the new trees will develop root systems adapted to their position due to the high probability of trees falling due to windfall. For trail creation they recommend that any new trails should avoid large specimen trees and root disturbance should be kept to a minimum. For the full arborist report please see Appendix B.

## 4.7 STEEP SLOPES

The north, east, south and west slopes of Arbutus Hump have areas of steep slopes with a greater than 30% grade for more than 10 m. The slopes are vegetated with mature Douglas-fir trees and arbutus with a dense shrub layer. The current development plans have reserved a large portion of the development area (DPA 11) as greenspace (Figure 1), specifically on the steep slope areas. Retaining the vegetation on these slopes will help stabilize the soil and reduce erosion. Additionally, a geotechnical report has been completed and has identified the east-central portion of the property as the ideal location for development for protection of steep slopes.

# 5 POTENTIAL ENVIRONMENTAL EFFECTS

The potential impacts of the proposed development of the property on the environment are:

- Infringement on sensitive ecosystem areas,
- Spread of invasive plant species,
- Alteration of wildlife habitat,
- Changes to slope stability, and
- Sediment movement in the project area.

The residual environmental impacts of the activities on the property will be reduced by the implementation of the mitigation and restoration measures recommended in Section 6 of this report.

### VEGETATION

The effects of tree and vegetation removal may include loss of biodiversity of plant species and increased susceptibility to invasive plants not only in the cleared area but also in adjacent plant communities. Vegetation immediately adjacent to cleared areas may experience changes to the canopy structure and understory plant species due to windthrow and increased light and moisture penetration.

### INVASIVE SPECIES

Invasive plants are particularly adept at colonizing degraded plant communities and disturbed soils in high traffic areas, such as the margins of roads, trails and parking areas. Invasive plants establish readily in disturbed areas as they have a wide ecological tolerance and grow and propagate quickly. The effects of invasive plant establishment may be the reduction or displacement of native species by capturing resources and occupying habitats.

### WILDLIFE AND WILDLIFE HABITAT

Habitat loss and alteration from vegetation clearing can cause displacement of wildlife, use of less suitable habitat, reduced foraging ability, increased energy expenditure and lower reproductive success. Reduced habitat effectiveness can occur as a result from the creation of habitat edges and the introduction of buildings with many windows into previously unused spaces can increase mortality risk for birds.

### SENSITIVE ECOSYSTEMS

Disturbance of sensitive ecosystems like the Arbutus Hump can result in a loss of biodiversity and ecosystem function. Soil compaction due to compaction and installation of infrastructure can change the surface hydrology of the ecosystem negatively impacting the specific needs of the vegetation causing a shift in species dominance negatively impacting the composition of the sensitive ecosystem.

### STEEP SOPES

Removal of vegetation on steep slopes can result in destabilization of the soil. Removal of trees can alter the incidence of rain on the forest floor surface, resulting in slope and sediment movement downslope.

### EROSION AND SEDIMENT

Removal of vegetation and ground disturbance may expose soils to erosion and can result in the movement of sediment on the property. Damage or degradation of soil surfaces during construction can include loss of soil structure, increased erosion, and soil compaction which can negatively affect post-construction reclamation efforts.

# 6 RECOMMENDED ENVIRONMENTAL PROTECTION MEASURES

The mitigation measures provided in this report are designed to protect sensitive ecosystems and were developed in accordance with:

- Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) (BC Ministry of Environment [MOE] 2014a),
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (Government of BC 2014), and
- Environmental Best Management Practices for Urban and Rural Land Development in British Columbia (BC Ministry of Water, Land and Air Protection 2004).
- Holland Creek Local Area Plan Bylaw No. 1488 (ToL 2016).



### VEGETATION

The following measures must be implemented to protect trees and vegetation outside of the necessary areas of disturbance:

- Clearing should be limited to only those areas required for grading, paving, servicing and the building envelopes to save trees and minimize the removal of sensitive ecosystems.
- All efforts should be made to save any trees larger than 60-80 cm diameter.
- No mature trees should be removed for the construction of the trail network.
- For any landscaped areas, native plants are recommended. Table 3 provides a list of native vegetation species recommended that are suitable for this ecosystem.

**Table 4. Recommended native vegetation to plant in disturbed areas**

| Common Name | Species |
|---|---|
| Big leaf maple | *Acer macrophyllum* |
| Douglas-fir | *Pseudotsuga menziesii* |
| Dull Oregon-grape | *Mahonia nervosa* |
| Salal | *Gaultheria shallon* |
| Baldhip rose | *Rosa gymnocarpa* |
| Red currant | *Ribes sanguineum* |
| Sword fern | *Polystichum munitum* |
| Oceanspray | *Holodiscus discolor* |

| Common Name | Species |
|---|---|
| Red huckleberry | *Vaccinium ovatum* |

The purpose of using native species is to not require irrigation once they are established; typically with two years of irrigation. The optimal time for revegetation is in the fall, prior to the wet winter season, or early spring. However, planting at any time of the year (with irrigation) is acceptable to prevent invasive species. In addition to the native plants, seeding with a high density (40 kg/ha) of a cover crop of native clover or Quick Grow Revegetation Mix by Premier Pacific Seeds (or similar) is recommended to compete with weed species, fix nitrogen and provide slope stabilization.

**INVASIVE SPECIES**

Invasive weed control is difficult for established populations. Immediate eradication of new and small infestations should be a high priority in order to prevent further spread into the remaining undisturbed habitat.

Species should be removed using the most appropriate methods, at the correct time of year, and plant material must be disposed of correctly to avoid re-establishment or spread. Due to the resilience of broom, cutting and removing is recommended as a more effective alternative to chemical control. Details of removal methods for the invasive species if they occur in future on the property are provided in Table 5.

Large amounts of scotch broom have become established throughout the property. The plants should be removed by hand pulling or cutting to enhance the ecosystem within the Arbutus Hump area. Multiple removal dates will be needed to ensure that re-establishment of the broom population does not occur. Then planting with shade producing species will reduce the potential for broom coming back.



**Table 5. Removal and disposal methods for invasive species**

| Species | Removal Method | Removal Timing | Plant Disposal |
|---|---|---|---|
| English Holly | English holly can be removed by hand pulling small seedlings or cutting mature trees at ground level removing all plant material. | Removal is best done before flowering or berries to eliminate seed production. | Bagged and disposed of properly in a landfill. Do not 'recycle' garden debris or compost. |
| Oxeye Daisy | Oxeye daisy can be removed by pulling or digging up plants, ensuring that all roots are removed. New shoots may emerge from remaining root portions. Mowing can also be effective but should be repeated as it may stimulate growth. | Removal is best done before flowering to eliminate seed production. | Bagged and disposed of properly in a landfill. Do not 'recycle' garden debris or compost. |
| Scotch broom | Small broom plants can be pulled easily from the ground by hand. Larger plants should be cut below the root crown using loppers or a pruning saw. Avoid disturbing the soil which can stimulate dormant broom seeds to sprout. | Scotch broom removal should occur in late summer, after native wildflowers have gone dormant but before its seed pods begin to open. | Bagged and disposed of properly in a landfill or burning. Do not 'recycle' garden debris or compost. |

To control and minimize the spread of invasive weeds on the site the following measures will be followed:

- Clean all machinery before arrival onto the site to ensure that more weed seeds and other propagules (e.g. pieces of root) are not brought into the project area.
- Use available soil on site where possible. If topsoil is imported from external areas, ensure that it is from a weed-free source.
- Following topsoil application – seed/plant immediately with landscape plants and grasses to reduce weeds occupying bare soil. If construction is in the winter, complete planting/seeding in the early spring, immediately prior to the first growing season.

**WILDLIFE AND WILDLIFE HABITAT**

The following measures should be taken to minimize impacts on wildlife and wildlife habitat:

- Avoid or limit the removal of established trees and shrubs, where possible, with the exception of identified danger trees and within the project footprint.
- Avoid removal of the wildlife trees outside of the building and road footprints, providing they are not a safety concern.
- Vegetation alteration should be completed outside of the migratory bird window (mid-March to end of August; Government of Canada 2021) particularly the removal of mature trees and shrubs.
- If vegetation clearing is scheduled within the sensitive time period for breeding birds, a QEP should conduct nest search surveys a maximum of 5 days prior to the start of activities. If an active nest is discovered during nest searched or clearing activities, the nest will be subject to site-specific mitigation measures (e.g. protective buffer around the nest or unobtrusive monitoring) until the young have naturally fledged/left the area. Due to the high amount of bird activity observed on the property, it is recommended that any clearing be completed outside of the migratory bird window.
- Where suitable and safe, retain habitat that provides shelter for wildlife, such as standing dead trees and downed logs.

**STEEP SLOPES**

No trees should be removed during construction without prior confirmation from consulting geotechnical and/or arborist as required, in order to maintain slope stability. No trees should be removed from the designated green space areas.

**EROSION AND SEDIMENT CONTROL**

The primary focus of erosion and sediment control planning is erosion control; if there is no erosion then there is no sediment. Erosion control is far more cost effective to implement and manage than sediment control.

The following mitigation measures should be implemented to minimize the potential effects of the project on the natural environment:

- Install wattles along the eastern slopes to minimize sediment transport downslope.

- Regularly inspect and maintain the erosion and sediment control measures during all phases of the project.
- Keep the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized.
- Heed weather advisories and scheduling work to avoid wet, windy and rainy periods that may result in high flow volumes and/ or increase erosion and sedimentation.
- Any loose soil storage should be in flat areas, covered and protected with a sediment fence below.
- Minimize amount of time soils are exposed by seeding and planting as soon as disturbance or construction is complete. Cover exposed soil areas with tarps if for a prolonged period or during rainfall events.
- An Erosion and Sediment Control Plan is recommended prior to construction, including drawings of the final plans showing locations of erosion and sediment control measures.



# 7 PLANNED ENVIRONMENTAL MEASURES FOR DEVELOPMENT

The Holland Heights Neighbourhood is dedicating over 30% of the land for natural recreation and parks. This includes the retention of the Arbutus Hump area (DPA 11) and creation of 5 km of trails throughout the area. In addition to the creation of green space, Lamont Land is incorporating the following environmental measures for the subdivision development.

## 7.1 DARK SKY LIGHTING

Holland Heights will include dark sky lighting to prevent light pollution within the neighbourhood. All outdoor light fixtures will be fitted with shields to prevent upward light movement and minimize glare. Additionally, they will not use LED or metal halide lights as they contain a large amount of blue light. Blue light brightens the sky more than any other color of light so it will need to be reduced (International Dark-Sky Association 2021).

## 7.2 VEGETATED BOULEVARDS

The designs landscape features include tree lined streets that include a 2.5 m boulevard with curb and trees lining both sides of the streets. This will increase soil stability biodiversity of the neighbourhood. The planted tree should be native to the area and approved by a QEP or arborist. Recommended species are provided in Table 3.

## 7.3 LOT COVENANTS

There is potential for 219 landscape covenants on the lots to ensure Low Impact Development standards and reduced impact on environment specifically for hillside homes. These covenants are ‘no build’ areas and will protect a portion of each lot to ensure that the habitat and slope stability can be maintained through the retention of native vegetation.

## 7.4 INVASIVE SPECIES REMOVAL AND HABITAT ENHANCEMENT

The mitigation recommendation on Section 6 will be used as a part of habitat/ecosystem improvements in the Arbutus Hump Area.

## 7.5 SLOPE MANAGEMENT

In addition to protecting slopes that are >30% in gradient. Lamont land will limit fill slopes with retaining or planting of the slopes.

## 7.6 MINIMUM VERTICAL SPACING

A minimum vertical separation distance of 25 m is to be achieved between the nearest home and the Summit of Arbutus Hump to ensure new homes are visually and physically separated from the area. This will minimize the effects of development on the landscape as well as create a buffer from ongoing impacts from adjacent households.

# 8 CONCLUSION

The environmental impacts of the proposed Holland Heights Subdivision neighbourhood has been presented in this report. During the development of the property, implementation of the mitigation and restoration measures recommended in this report, including, eradication of invasive species, creation of buffer zones between woodland and infrastructure, and the retention mature trees for the construction of the trail network to minimize the impacts of the proposed development on the environment.




Julie Budgen, R.P.Biol., B.Sc.,
Environmental Planner
Corvidae Environmental Consulting Inc.

Brent Rutley, BIT, B.Sc.

Environmental Biologist

Corvidae Environmental Consulting Inc.

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# APPENDIX A – SITE PHOTOGRAPHS

**Photo 1. View looking east at the eastern slopes. May 18, 2021.**

**Photo 2. View looking north from the top of Arbutus Hump. May 18, 2021.**

**Photo 3. View looking east at the western slopes from adjacent roadway. May 18, 2021.**

**Photo 4. View looking south at the new cleared road way adjacent to the eastern boundary of DPA 11. May 18, 2021.**

**Photo 5. View of the invasive scotch broom on the property. May 18, 2021.**

**Photo 6. View looking north at old logging road running down the northern slope. May 18, 2021.**

**Photo 7. View looking east at the extremely dense scotch broom infestation on the southeastern slopes of the Doug fir / arbutus red listed ecological community. September 8, 2021.**

# APPENDIX B – ARBORIST TREE MANAGEMENT REPORT

**Arbutus Hump, Ladysmith – Tree Management Report**

## Introduction

The proposed development of the Arbutus Neighbourhood to the southwest of Ladysmith, BC will involve construction in areas currently occupied by woodland. The area around the higher ground at the southern end of the site is known as Arbutus Hump and it will be retained as a natural area for its recreation and habitat benefits. Bartlett Tree Experts were asked to visit the Arbutus Hump site, assess the woodland, comment on the condition of the tree stock and make recommendations for future management. We were asked to form an overview of the woodland rather than a detailed, tree-by-tree assessment. Such an assessment may be necessary once detailed plans for the area have been agreed.

## Observations

We visited the site on Tuesday May 11 and carried out a ground level assessment by walking through the area shown on the maps provided to comprise of DPA 11. We located a surveyor's corner pin on the west side of the site but did not find any other markers. We navigated the area using GPS and by pacing out distances taken from the scaled site plans.

The tree species represented on the site are:

- Pacific madrone (*Arbutus menziesii*)
- Douglas fir (*Pseudotsuga menziesii*)
- Western red cedar (*Thuja plicata*)
- Western hemlock (*Tsuga heterophylla*)

The majority of the trees appeared to be in good condition with normal growth rates for the species and the location. We did not observe any significant pest or disease outbreaks and those trees that were found to be dead or in terminal decline appeared to be entirely natural. While we did not undertake a tree risk assessment of the site, we observed three trees that were in such poor structural condition that they could pose a risk to visitors.

The woodland was quite open with good vegetation ground cover and light penetration. There was abundant natural debris which likely resulting from natural processes as well as past forest management. The soil appeared to be shallow with rocky outcrops visible throughout. Several large trees on the south side of the site had suffered root plate failure, in part due to them finding themselves on the newly created forest edge following the creation of the adjacent cut block.

## Discussion

The Arbutus Hump area is occupied by a naturally occurring woodland. We were informed that it was logged approximately 20 years ago and the resulting regrowth amongst the large conifer species has

occurred since then. However, judging from the size and maturity of many of the Pacific madrones, these trees were present long before the last logging operation. Given the high percentage of this species around the summit of the hump, the area was likely left relatively untouched by the logging. Pacific madrone is the dominant species at over 70%. It is native to the area and would have formed the woodland naturally rather than being planted. In fact, most attempts to propagate, move or plant this species end in failure so we can be almost certain that it is naturally occurring.

Other than one notable specimen on the south side of the site, the Douglas fir were found to be relatively young with trunk diameters up to 40cm. This would suggest that they were too small to log in the last operation or have seeded since. The presence of young and semi-mature western red cedar and western hemlock at the edges of the site suggest that planting took place following the logging. These species do not have older representatives in the area and seem to have been introduced.

### Construction Impacts

The site plans provided show the future construction of a subdivision to the north and east of the Arbutus Hump area. This has the potential to impact trees within the Arbutus Hump, particularly at the interface between woodland and construction areas. The most common cause of tree decline around construction activity is the damage of root systems through direct impacts (such as roots being cut or crushed) and the degradation of the soil ecosystem through grade changes or compaction. Such damage can occur from the single inadvertent pass of heavy equipment or misdirected run off so it is important for detailed plans to be produced once a final design has been agreed.

Even with good quality, well placed tree root zone protection in place, the likelihood of structural tree failure is dramatically increased when we cut into an established woodland. As we observed on the southern edge of the Arbutus Hump area, trees that grew up on the inside of a woodland did so with the protection of neighbouring trees. They only produce structural support roots sufficient for their protected location so when they suddenly find themselves on the new leading edge of the woodland, they are often inadequately supported. Similarly, trees within the woodland produce long slender trunks with a relatively small canopy which is more prone to stem breakage when exposed to the wind without protection.

The resulting tree failures at newly created woodland edges can be undesirable for the aesthetics of the area and the health of the ecosystem. However, the construction of houses and streets and the presence of people and traffic introduces potential targets that can be damaged or harmed in the event of the structural failure of a tree. For this reason, we recommend creating buffer zones between infrastructure and the leading edge of the woodland where larger trees that are more likely to fail are removed at the start of the project and before targets are introduced. These areas can be allowed to become tree covered over time through natural regeneration and planting as the new trees will develop root systems adapted to their position.

### Creation of Trails

The introduction of trails into the woodland will provide residents and the public with a great natural resource as well as some potentially fantastic views. Where possible, any new trails should avoid large

specimen trees and root disturbance should be kept to a minimum. The project arborist should be consulted over the route of any proposed trails and their construction should aim to be minimally invasive.

### Management of Tree Risk

Three trees were identified as posing a potential risk to visitors to the woodland and these should be removed at the start of the project. However, most trees on the site had dead branches or structurally poor unions that could make them prone to failure. But unlike street trees with constant traffic beneath them, it is not advisable or desirable to attempt to remove all potential hazards from such a natural area. Many such hazards are beneficial to wildlife and actually add to the interest and beauty of the woodland. No tree is ever safe unless we cut it down and remove it from the site. A big enough storm can fell any tree so absolute safety can never realistically be achieved. Instead we rely on a system of risk assessment for trees that have potential targets (such as houses or people) and this helps inform the decisions on future tree management.

### Woodland Management

Other than the mitigation of risk trees at the edges of the site and over trails, active woodland management should be quite minimal. There appears to be adequate natural regeneration in most areas which will produce replacement trees where needed in the future. As discussed earlier, moving or planting Pacific madrone trees is not feasible or required as the species will find its own niche and do very well on its own. We do not recommend changing the tree species composition of the woodland. The nature and quality of the soils will dictate what grows and what will not. However, control of introduced or invasive species may become necessary in the future as the area around the woodland changes.

Strathcona Forestry Consulting



# Ladysmith – Lamont Land

## Wildfire Hazard Assessment

*Prepared for*: Lamont Land, via Corvidae Environmental Consulting Inc.

*Prepared by*: Strathcona Forestry Consulting
PO Box 387 Stn Mn
Duncan BC V9L 3X5
strathcona.fc@shaw.ca

22 September 2021

# Executive Summary

In accordance with the Town of Ladysmith's Development Permit Guidelines for Wildfire, Lamont Land, via Corvidae Environmental Consulting Inc., retained Strathcona Forestry Consulting to conduct a wildfire hazard assessment of residential development proposed at a large parcel at an area to be known as Arbutus Hump.

Assessment determined that the wildfire threat at the subject property currently is High. Contributing factors include: fuel loading (forest vegetation) loading at the site, sloping topography, intermix (> 1 structure/ha), warm aspect, HeadFire Intensity > 2000 k2/M, and the lack of completely developed fireflow and access. Under the provincial Wildfire Threat Rating system, ratings must be moderate or less to be considered acceptable.

Living in a fire-prone ecosystem involves taking the necessary steps to protect homes, property, and community from wildfire. Development standards play a significant role in reducing the potential impact a wildfire will have on a community (FireSmartCanada.ca; FireSmartBC.ca). FireSmart strategies for wildfire prevention and preparedness have proven effective at reducing risk related losses to wildfire. This report contains FireSmart wildfire risk reduction recommendations intended to increase resiliency of the subject proposal.

In my professional opinion, if the recommendations contained in this report are followed through planning and construction – and continue after buildout, the risk of wildfire (and windthrow) can be reduced to a level acceptable to ensure the safety of the intended development.

Fire prevention and protection in the interface zone are ongoing processes. Long-term implementation of FireSmart mitigation is essential to ensure protection for life, property, and ecological processes in Ladysmith's wildland interface.

# Introduction

In accordance with the Town of Ladysmith's Development Permit Guidelines for Wildfire, Lamont Land, via Corvidae Environmental Consulting Inc., retained Strathcona Forestry Consulting to conduct a wildfire hazard assessment of residential development proposed for a large parcel at an area to be known as Arbutus Hump.

The interface (wildland urban interface/wildland residential interface) describes any area where combustible wildland fuels are found adjacent to homes or other buildings. Under Section 919.1(1) (a) of the Local Government Act, development permits may be designated where protection of Natural Hazard Lands is justified. Natural hazards, including wildfires, may put life and property, and local biodiversity, at risk if development is inappropriately situated and not well planned. Areas assigned at elevated risk are designated in a Development Permit Area (DPA). The objective of the DPA is to properly manage the risks associated with the hazard (interface wildfires).



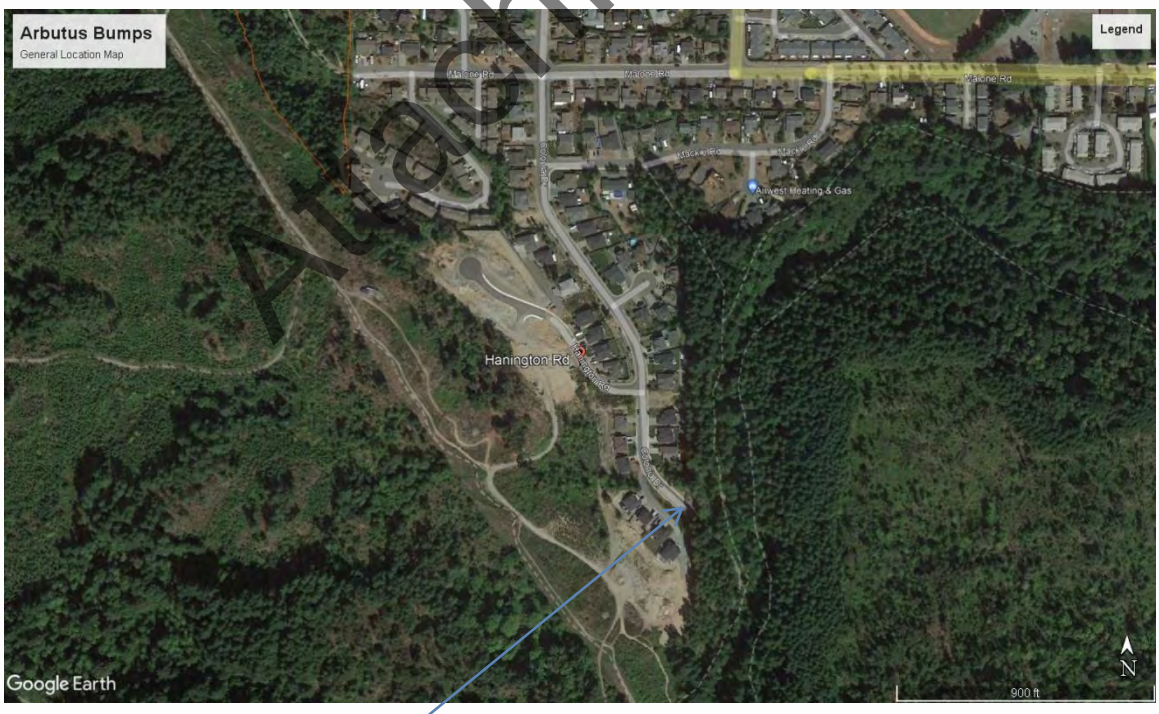
# Hazard Assessment

This report describes the vegetation, terrain, and infrastructure on and around the subject property, and provides recommendations to reduce the risk of wildfire. Assessment criteria are based on Rating Interface Wildfire Threats in British Columbia (https://www2.gov.bc.ca/), FireSmart (FireSmart, Protecting Your Community From Wildfire (Second Edition. Partners in Protection Partners in Protection, 2003 (https://www.firesmartcanada.ca/), and the Home Owners FireSmart Manual (BC Edition (https://www2.gov.bc.ca/assets/gov/public-safety-and.../homeowner-firesmart.pdf). Fire behavior modeling is standardized after the Canadian Forest Fire Danger Rating System (CFFDRS). Fuel Types listed in this assessment are customized from the CFFDRS Fuel Type list for applicability in south coastal BC. Wildfire threat assessment was conducted through an analysis of fuel threats in and adjacent to the proposed development, as described in the 2017 Wildfire Threat Assessment Guide and Worksheets (MFLNRO, 2017). This process, used by qualified environmental professionals, employs physical and biophysical factors, combined with fuel hazards, to determine the wildfire threat (low, moderate, high, or extreme). Fire risk is based on four classes: low, moderate, high, and extreme. Recommendations in this report conform to BC Building Code standards and fire hazard planning authorized by Section 3(2) of the BC Fire Services Act.

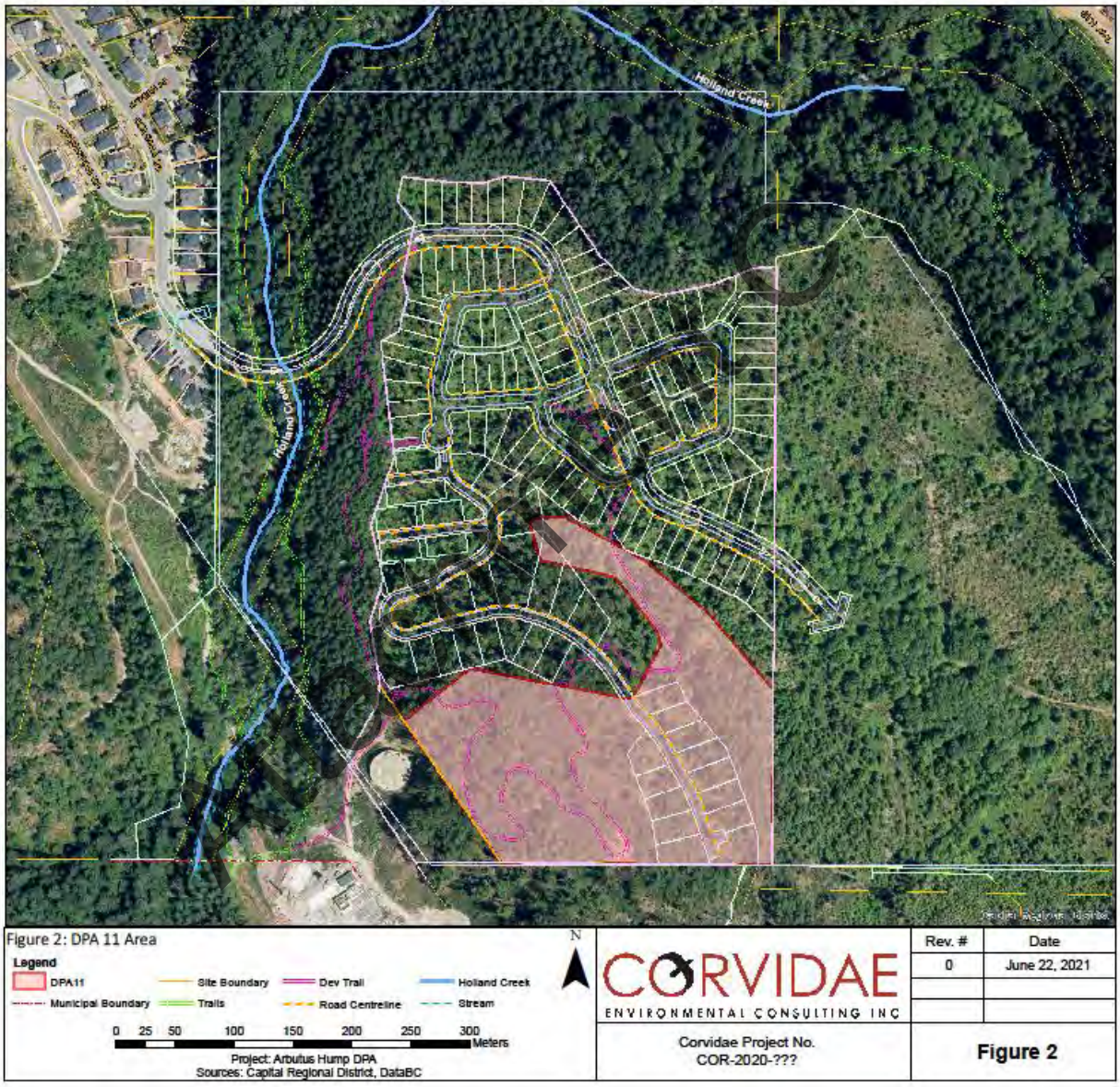
**Field Inspection:** Strathcona Forestry Consulting conducted fieldwork in August and September 2021. Field investigation entailed an analysis of the interface fire hazard that the land is exposed to, from the perspective of the general area, local site, and proposed and existing structures in the general vicinity, up to 100+ m from property boundaries, where feasible.

**Location and Description of Proposal:** Developer Lamont Land Ltd. is proposing to develop a 360 acre land parcel it owns within the Holland Creek Local Area Plan (HCLAP) as a predominately residential area near the centre of town (see maps below and following pages). The HCLAP, which forms part of the Town of Ladysmith's Official Community Plan, outlines planning, design principles, land use, transportation and servicing policies for the 360 acre area.

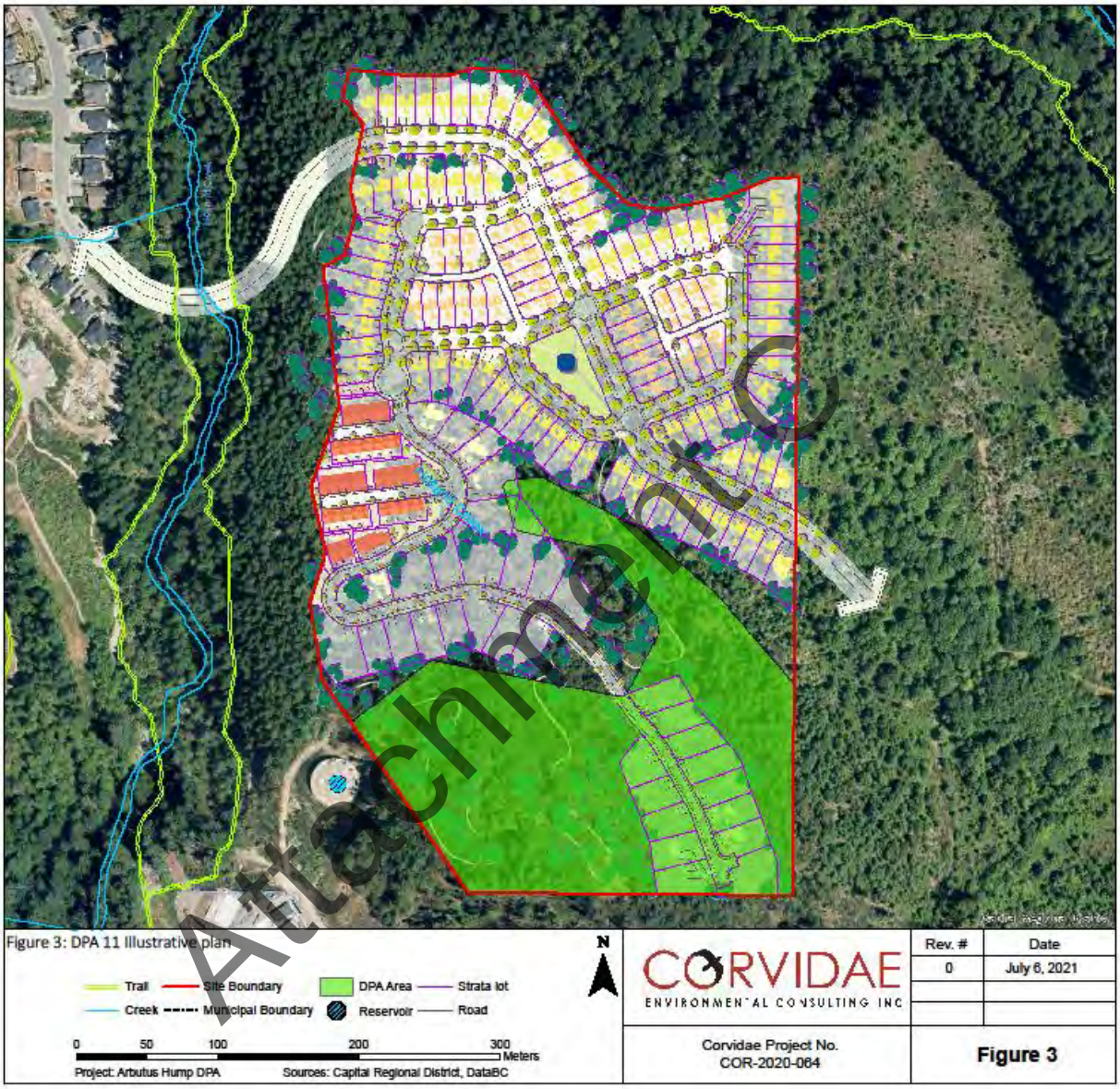
In the spring of 2021, Lamont Land Ltd. completed construction of a bridge crossing at Colonia Drive to access the land parcel, which is currently zone Single Dwelling Residential (R-1). The property boundary is around the "All Lots" area (see Site Plans pgs. 5&6). DPA 11 is a protected area, aka Arbutus Hump. More than a third of the entire subject parcel is preserved as trail and parkland.




***Colonia Drive will access proposed development at the 360 acre parcel.***




***Arbutus Hump. DPA 11 Area is highlighted in pink.***






***Arbutus Hump. DPA 11 Illustrative Plan (green).***

# Wildfire Hazard and Risk

Wildfire hazard is a process, a phenomenon or a human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption or environmental degradation. Wildfire hazard can be described qualitatively as a fire environment—fuel, weather, topography, and ignitions.

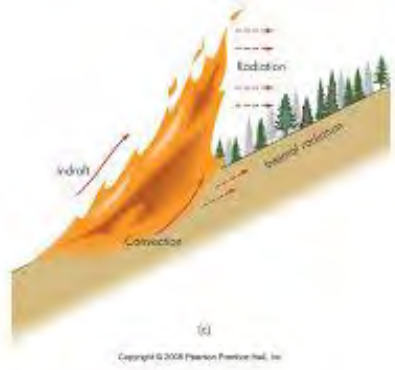
Risk assessment for wildfire and its impacts to communities considers both the likelihood of a wildfire and the potential consequence associated with that likelihood. For example, if the fuel (i.e. the hazard) ignites and the fire spreads towards the community (probability), the wildfire can become a threat to life and property (consequence) with an associated risk of loss.

Determination of the wildfire hazard and risk involves a detailed assessment of potential fire behaviour, field reviewed fuel characteristics, proximity of fuel to the community, local fire spread patterns, topographical considerations and local factors.

**Fire Behaviour.** Fire behaviour has three components: weather, topography, and fuel. Fire behavior predicts how forest and wildland vegetation (fuel) will burn under different conditions. Weather and topography cannot be changed; alteration of fuels across the landscape is the only way to lower fire intensity and change fire behaviour.

**Biogeoclimatic Classification.** The subject proposal is located in the moist maritime Coastal Douglas-fir moist maritime (CDFmm) biogeoclimatic subzone. Summers are warm and dry, while winters are moist and mild. Growing seasons are long, and often feature pronounced water deficits on zonal (average) and drier sites. Fire Danger Ratings (i.e., the risk of a fire starting) often reach High and Extreme in summer. Conditions had been exceptionally dry throughout the summer of 2021.

**Topography.** Physical site characteristics impact fire behavior by affecting ignition potential and the rate of fire spread. The subject parcel mostly comprises a moderately sloping site, except for the "arbutus hump," a steeply sloping area.




Wildfires typically burn uphill. Warmer aspects tend to burn "hotter."

**Aspect.** Aspect is generally northeast. Elevational gradient is 120 to 200 m. Average elevation is 122 m a.s.l.

**Vegetation.** Fire behavior predicts how forest and wildland fuels (vegetation) will burn under different conditions. Fuel hazard means the potential fire behaviour, without regard to the state of weather or topography, based on the physical fuel characteristics, including fuel arrangement, fuel load, condition of herbaceous vegetation and the presence of ladder fuels.

Benchmark vegetative fuel types developed by the Canadian Forest Fire Danger Rating System Fire Behavior System (CFFDRS) are used to forecast how a wildfire will react (cwfis.cfs.nrcan.gc.ca ›) (refer to Appendix 2).



***Top photos: Forest cover on the balance of the area was cleared several years ago, and has brushed in with a mix of native and invasive trees and shrubs.***
***Bottom photo: Surrounding the parcel, mature forest with tall trees rims the parcel.***

**Major Fuel Types at subject site:**

| Fuel Types | Description | Forest Floor & Surface Fuels | Ladder Fuels | Wildfire Behaviour (why and how a fire spreads) |
|---|---|---|---|---|
| **C-5 Coniferous forest (with broadleaf component)** | Coniferous 2nd-growth forest (Fd leading), with arbutus component<br>-surrounds the parcel<br>-occupies Arbutus Hump | Dis- to continuous needle litter lvs. Moderately continuous shrub layer.<br>Moderately high fuel loading due to significant amount of woody downed material | Vertical CF continuity; significant ladder fuels due to understorey dead/dying | Fire start during warm, dry windy weather could result in High potential for Crown Fire Initiation. Sloping topography within and surrounding the parcel increases potential for fire behaviour |
| **C-2/C-3 Shrubby/ Brush / Grass / Invasives** | Previously disturbed lands (cleared within last 10-15 years, now brushed in) at proposed residential development area | Continuous layer native shrubs (salal, ferns) intermixed with invasive brush (Himalayan blackberry, broom, daphne), Moderate to high surface fuel loading. Broom is very combustible. | Moderately high ladder fuels due to intermixture of clumps of small to medium sized trees in brushy areas. | Thick shrub layer can impede emergency access for first responders |



**Risk of Ignition.** Risk of ignition represents the potential for fire starts. Risk of ignition could come from current and future property owners in the area, construction activities (at the subject site or surrounding vicinity), and/or hikers on the Holland Creek Trail. Risk of ignition is rated moderate (to high).


***Left: Holland Creek Crossing Construction. Right: View from Holland Creek trail to construction area.***

**Fire Spread and Intensity.** Head fire intensity is a numerical ranking of difficulty of control for specific fuel types. Flame length is a main visual manifestation. Head fire intensity is a major determinant of certain fire effects and difficulty of control. Numerically, it is equal to the product of the net heat of combustion, quantity of fuel consumed in the flaming front, and the linear rate of spread. Under warm, dry conditions, there is currently sufficient continuity of surface and ladder fuels to enable a fire to spread relatively quickly. Dry, windy conditions would increase the rate of spread.

The goal of Wildfire Risk Reduction (WRR) is to reduce HeadFire Intensity from 4 to 5 to less than 2000 kW/m (< 3, HFI column Moderate) (see chart following).

**Fire Weather Indices**

| **Hazard Rating** | **FFMC** Fine Fuel Moisture Code | **DMC** Duff Moisture Code | **DC** Drought Code | **ISI** Initial Spread Index | **BUI** Build Up Index | **FWI** Fire Weather Index | **HFI** Head Fire Intensity |
|---|---|---|---|---|---|---|---|
| Low | 0-76 | 0-21 | 0-79 | 0-1.5 | 0-24 | 0-4.5 | 1-2 |
| Moderate | 77-84 | 22-27 | 80-189 | 2-4 | 25-40 | 4.5-10.5 | 3 |
| High | 85-88 | 28-40 | 190-299 | 5-8 | 41-60 | 10.5-18.5 | 4 |
| Very High | 89-91 | 41-60 | 300-424 | 9-15 | 61-89 | 18.5-29.5 | 5 |
| Extreme | 92+ | 61+ | 425+ | 16+ | 90+ | 29.5+ | 6 |



**Spotting Potential.** Spotting is a fire behavior characteristic in which sparks or embers are carried up by the wind and/or convective column and fall into other downwind fuels to ignite additional fires beyond the zone of direct ignition by the main fire (Firewise.org). Fire spotting is one of the major ways that fires spread and homes are ignited and destroyed in wildland/urban interface fires. Firebrands can come down on and ignite combustible roofs, combustible items stored adjacent to homes, and other nearby combustible fuels. The resulting spot fires may go unnoticed and thus unsuppressed when an area has been evacuated of residents, when firefighters are spread too thin, or when spot fires are too numerous.

The maximum spotting distance in a particular fire varies according to several factors, including overall fire intensity, wind speed, fuel type, initial size of the ember when lofted up, and how rapidly it is burning (Firewise.org). If a fire start occurred during very

warm dry, weather (High/Extreme Fire Danger Ratings), there is a moderately high possibility of spotting in the area.

**Fire Protection**. The subject site is located within the service area of Ladysmith Fire Rescue (LFR), a volunteer fire department that provides protection to the Town of Ladysmith. The firehall is at 330 6 Avenue. Ladysmith Fire Rescue stated (21 September 2021) that response time to the subject property would be 11-13 minutes.

Response time can be delayed, depending on the time of day. The British Columbia Building Code addresses situations where the firefighter response time 'exceeds 10 minutes in 10% or more of all calls' by requiring higher levels of non-combustible construction and reductions on allowable areas of unprotected openings. The Building Code should address Fire Department concerns.

Fire department response time is the elapsed time, in minutes, from when the first firefighting unit is dispatched to when the first fire fighting unit arrives at the emergency scene. Fire department intervention time is crucial in determining the consequences of a fire in terms of deaths, injuries, and loss of property and damage to the environment. An early aggressive and offensive primary interior attack on a working fire is usually the most effective strategy to reduce the loss of lives and property damage. Outside of a 10-minute fire response time requires more stringent fire protection for construction.

Ladysmith Fire Rescue noted that the subject development is one-way in, one-way out. From the standpoint of safety, it is preferable to have two-way access.

**Mutual Aid**. Fire Departments within the Cowichan Valley Regional District operate under a mutual aid agreement with other fire departments within (and outside) the region. In the case of a serious fire, mutual aid from adjoining fire departments can benefit fire suppression by pooling manpower and resources (water supply, water tenders, etc.,). Mutual aid, however, may not always available.

**Wildfires**. Ladysmith Fire Rescue automatically responds to structure fires and small, easily accessible bush fires inside the fire service protection area (FPA). The Wildfire Management Branch generally responds to forested areas outside a FPA.

**Water Supply**. The subject site would be fully serviced.

**Access**. Safe access increases safety for both residents and firefighters, and also facilitates quick response by firefighters. As noted, access to the subject development will be one-way in; one-way out. Access will be from Colonia Avenue. Future road access may be extended east.

# Wildfire Threat Assessment Results

Scoring from the FireSmart assessment and fire behavior analyses determined the subject property currently has a High Fuel Assessment rating (see chart next page), contributing to a High Local Wildfire Threat Rating (below). Factors contributing to the elevated rating include: continuity and extent of fuel loading in the general area; HeadFire Intensity > 2000 k2/M; the possibility of delayed response; hilly topography; lack of current access and current fireflow; and intermix >1 structure/ha. Threat ratings must be low/moderate to ensure an area and/or structure(s) are safe.



| LOCAL WILDFIRE THREAT SUMMARY: Proposed Lamont Land Development | | | |
|---|---|---|---|
| **System:** | **Subcomponents** | **CURRENT ratings** | **Projected Ratings post-development*** |
| **MFLNRO Wildfire Threat Assessment** | **Fire Behaviour: Fuel, Weather, Topography** | **Fuel Assessment Class: High (see chart next pg.)** | **Moderate** |
| | **Structural (incl vicinity)** | **High** | **Moderate** |
| **Overall Rating:** | | **HIGH** | |
| **HIRV Model** | **Hazard**<br>**Impact**<br>**Risk**<br>**Vulnerability** | **High**<br>**High**<br>**High**<br>**High** | **Moderate**<br>**Moderate**<br>**Moderate**<br>**Moderate** |
| | | | |
| **Wildfire Risk** | Likelihood<br>Intensity<br>Susceptibility | **High** | **Moderate** |

*Projected ratings conditional upon compliance with recommendations contained in this report.

Compliance with FireSmart recommendations contained in this report should be sufficient to reduce wildfire threat rating to moderate.


*Wildfire risk triangle. (Scott et al. 2013).*

**Generalized Descriptions of the "Fuel Assessment Rating" classes:**

| | |
|---|---|
| **Low** | Fires may start and spread slowly. There will be minimal involvement of deeper fuel layers or larger fuels. |
| **Moderate** | Forest fuels are drier and there is an increased risk of surface fires starting. There will be involvement of the organic layer but larger dead material will not readily combust. |
| **High** | Forest fuels are very dry, new fires may start easily, burn vigorously; aerial fuel will be engaged in the flaming front. Most fuel in the organic layer will be consumed and larger dead fuel will be consumed in the smoldering combustion. |
| **Extreme** | Extremely dry forest fuel, new fires will start easily, burn vigorously; all aerial fuel will be engaged in the flaming front. Most fuel in the organic layer will be consumed and larger dead fuel will be consumed in the smoldering combustion. |

FMC (Fuel Moisture Content) 95% value based on 90$^{th}$ percentile drought conditions.

Fuel reduction targets should be sufficient to be effective to meet treatment objectives of reduced fire behaviour under 90$^{th}$ Percentile Fire Weather Index (FWI) Conditions (FFMC, ISI, BUI) from the BCWS weather network.

# Recommendations

Living in a fire-prone ecosystem involves taking the necessary steps to protect homes, property, and community from wildfire. FireSmart principles and best practices (wildfire prevention, mitigation, and preparedness) are advised to manage wildfire risk and impact (FireSmartCanada.ca; FireSmartBC.ca).

In my professional opinion, if the recommendations contained in this report are followed through planning and construction of the development site – and continue after buildout, the risk of wildfire (and windthrow) can be reduced to a level acceptable to ensure the safety of the intended development.



**Vegetation Management**

**General Precautions During Land Clearing and Construction**

- Ensure any land clearing activities are conducted in compliance with BC's Wildfire Act local bylaws.
- As per the BC Wildfire Act, if a high risk activity (i.e., land clearing) is taking place between 1 April and 31 October, the operator must keep at the activity site fire fighting hand tools, in a combination and type to properly equip each person who works at the site with a minimum of one fire fighting hand tool, and an adequate fire suppression system (onsite portable water tanker and fire fighting tools – shovels, pulaskis, portable water backpacks). In addition, efforts must be made to maintain an adequate fire break between any high risk activity and areas of continuous forest to ensure a fire originating at the site does not escape the site.
- During landclearing, develop an Emergency Plan of Action, listing key contact information in case of fire and/or other emergency at the site.
- Hazard abatement (removal of slash/disposal of debris piles) must take place in compliance with Town of Ladysmith bylaws.
- Ensure construction workers are made aware of the risk of fire in the interface zone, especially during dry summer weather.

**Hazard Tree Management**

- *As per WorkSafe regulations, prior to commencement of work at the site, suspect hazard trees (e.g. see photo at left) at/beside worksite will required assessment from a certified Danger Tree Assessor. Trees identified as Danger Trees will require treatment (removal / possible modification) from a certified tree service. Where safely practical, modified treatment can provide useful wildlife habitat.*

**FireSmart Zones –** (see Appendix 1)

- **Priority Zone 1a: 0-1.5 m**

A noncombustible surface should extend for 1.5 m around structures, accessory structures, and any attachments, such as decks. Avoid storing flammable outdoor items, such as wicker or wooden patio furniture, cushions, doormats, window boxes and planters, garbage cans without lids and BBQ propane tanks, which are all places where embers can land and start a fire, in this critical area adjacent to the home.

- Landscape with noncombustible landscaping materials, such as gravel, brick, or concrete
- Avoid woody shrubs, trees, or tree branches in this zone
- Create a noncombustible zone underneath and for 1.5 m around any RVs/vehicles
- Mitigate any auxiliary structures to same standards as those of home

- **FireSmart Priority Zone 1: 0-10 m**

Establish and maintain an environment around strcutures and accessory structures that will not support fire. Focus on fuel removal, conversion, and reduction.

- Plan on landscaping with a low density of fire resistant plants and shrubs. Avoid the use of cedar hedging.
- Maintain landscapes with regular irrigation, mowing, pruning, raking, weeding and dead plant removal.
- Create non-flammable hardscapes, such as rock, gravel, and water features, which, function as firebreaks by breaking up areas of fuel. Rock can provide a natural looking, low-maintenance and water-efficient mulch and as well as a fire-resistant buffer zone.
- Group fire resistant plant materials in islands. Group plants in islands surrounded by nonflammable materials, such as rock; employ landscape elements together to create breaks between fuels.
- Limb (prune) trees 1.5 to 2m from the ground. Create space between trees and shrubs – a general rule is twice the height of what the plant will be at maturity. Remove tree limbs closer than 15-feet from power lines and any touching the house or other structures.
- Avoid using woody debris, including bark mulch, as it provides potential places for fires to start
- Store items such as construction materials, patio furniture, tools and decorative pieces at least 10 m from the homes and any structures

- **FireSmart Priority Zone 2: 10-30 m**

Extend the fuel modified area 10-30 m around structures. Conduct FireSmart thinning, pruning, and fuel reduction strategies in this zone to reduce fuel loading.

- Thin and prune evergreen trees to reduce hazard in this area
- Within 30 m of homes and any other structures, selectively remove evergreen trees to create at least 3 m of horizontal space between the single or grouped tree crowns, and remove all branches to a height of at least 2.5 m from the ground on the remaining evergreen trees. (For smaller evergreen trees; general rule of thumb is prune branches up to a third the height of the tree)

- Regularly clean up accumulations of fallen branches, dry grass, dried arbutus leaves, and conifer needles from the ground to eliminate potential surface fires

- **FireSmart Priority Zone 3: 30-100 m**

Where fuel modification in PZ1 and PZ2 is insufficient to protect structures and/or property, and where property boundaries permit, thin and prune trees in order to create an environment that will not support high-intensity crown fires.

- Look for opportunities to create a fire break by creating spaces between trees and other potentially flammable vegetation
- If possible, prune the trees located up to 100 m from the homes
- Thin and prune overgrown trees to reduce hazard
- Regularly clean up accumulations of fallen branches, dry grass, and needles from the ground to eliminate potential surface fires

**General Principles of FireSmart Landscaping**

- Incorporate FireSmart landscaping by using fire-resistive, widely spaced trees, native shrubs and groundcover in combination with stone and/or water features and/or maintained lawn areas. See FireSmart Guide to Landscaping. *https://www.firesmartcanada.ca/resources-library/firesmart-guide-to-landscaping*
- Promptly re-vegetate any areas of soil disturbed during clearing and construction with approved landscaping materials and/or native plant species to prevent further encroachment from invasive plant species (i.e., blackberry, broom, etc.).
- Powerlines should be clear of branches and other vegetation.

**Arbutus Hump Protected area and Holland Creek Trail**

- Consider installing split rail fencing around boundaries of protected area(s), including “Arbutus Hump” and the Holland Creek trail forest.

***Large trees are found in the Holland Creek Trail corridor.***

**Construction**

The roof is the most vulnerable component of a structure. Sparks and burning embers from a wildfire can travel long distances and quickly ignite flammable roofing material.
Siding material is also vulnerable to wildfire. Combustible debris can accumulate at the vents and openings on your home and be ignited by embers during a wildfire.

- Use fire-retardant roof covering assemblies rated Class A, B, or C (i.e., metal, tile, ULC-rated asphalt) and feature non-combustible siding materials (i.e., stucco, metal siding, brick, cement shingles or cementitious materials, poured concrete, or ULC-rated wood siding) on new structures. Metal, clay tile, and rated asphalt shingles are the most fire resistant roofing materials. Siding materials such as stucco, metal, brick and concrete offer superior fire resistance to wildfire. Logs and heavy timbers are less effective, while wood and vinyl siding offer very little protection.
- Follow FireSmart guidelines for design, construction, and maintenance of window and door glazing, eaves and vents, and decking. Install noncombustible material for all vents (should be 3 mm screening or ASTM fire rated vents). Metal products are recommended for vents and vent flashing. https://www.firesmartcanada.ca/
- Ensure structures are equipped with working smoke alarm(s).
- Sheath in the base of decks, balconies and homes with fire-resistant material to reduce the risk of sparks and embers igniting the home. Use metal railings or tempered glass for decks and balconies. Select noncombustible patio furniture and decorations.
- If a wood fence is installed, ensure at least a 1.5 m noncombustible break between the fence and a structure (i.e., a metal gate with a stone wall to break up combustible fence).

**Maintenance**

- Regularly inspect siding for locations where embers could accumulate and lodge.
- Maintain and remove combustible debris near exterior walls to reduce a building's vulnerability to ignition during a wildfire.
- Regularly remove debris from gutters – sparks and easily ignite these dry materials.
- Inspect vents and openings regularly to ensure vents are in good repair, and remove any accumulated combustible debris.

**Water Supply / Fire Protection**

- Ensure water main, fire hydrant capabilities and servicing meet Town of Ladysmith Engineering specifications.

**Access**

- Ensure roads and driveways meets BC Building Code and Town Engineering requirements.
- As recommended by the fire department, plan on two-way access.
- Ensure address signage is clearly evident during the construction phase and at build-out. Letters, numbers, and symbols should be at least 10 cm high, with a 12 mm stroke, contrast with the background colour of the sign, and be reflective.
- Ensure new structures are mapped on fire department "pre-org" (fire planning) maps.

**FireSmart Awareness / FireSmart Community Resilience**

- In liaison with the Town of Ladysmith, encourage residents of new neighbourhoods to include FireSmart strategies in their everyday lifestyle. Residents working together to create resilient communities can apply for FireSmart Community Recognition https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwig1oGy-vrdAhUQHjQIHfuWA1EQFjAAegQIBhAB&url=https%3A%2F%2Fwww.firesmartcanada.ca%2Ffiresmart-communities%2Fcommunity-recognition-program%2F&usg=AOvVaw0ss0JqM2pjcyyHEjczSjU

**Regulatory Provisions**

- Conduct follow-up assessment (at building permit) to ensure appropriate mitigation measures have been implemented.

## Appendix 1. FireSmart Interface Priority Zones

In interface areas, FireSmart advocates the establishment and maintenance of Fuel Management Zones* extending outward from structures and along access routes:

Zone 1 a (0-1.5m)
Zone 1 (0-10 m).
Zone 2 (10-30 m).
Zone 3 (30-100 m).
(FireSmart, 2003; updated 2018)

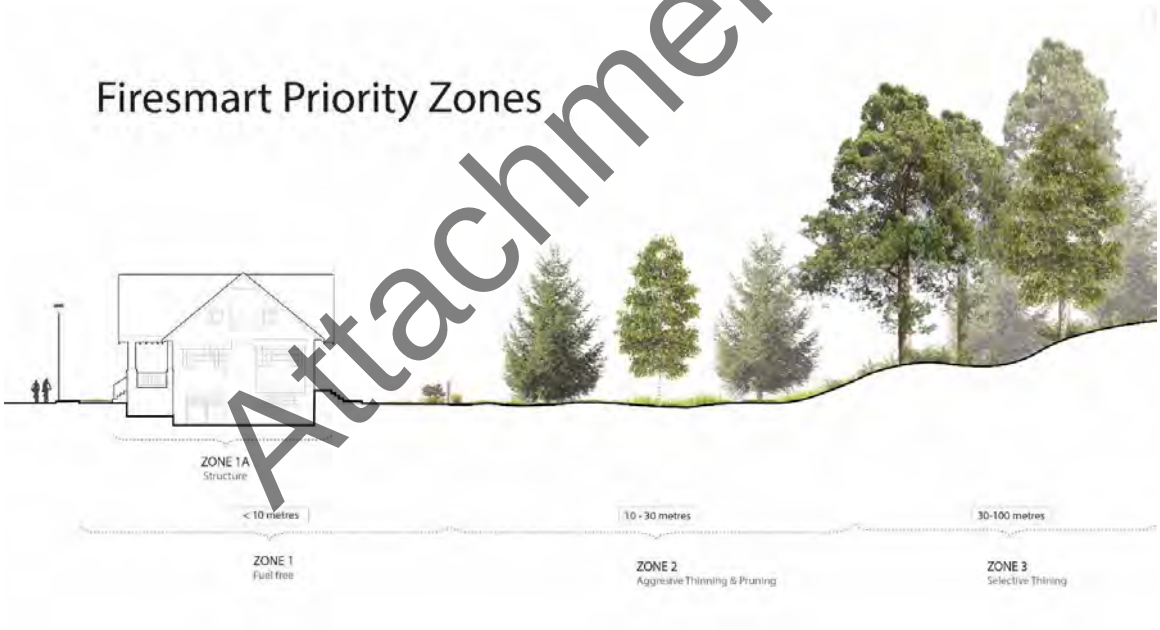
**Zone 1a (0-1.5 m)**: This is the noncombustible zone, where it is very important not to have any combustibles next to buildings.

**Zone 1 (0-10 m)**: The main objective of vegetation management is to create an environment that will not support fire. Vegetation management focuses on fuel removal, conversion, and reduction.

**Zone 2 (10-30 m)**: Where treatment in PZ 1 is not sufficient to significantly reduce the fire hazard due to fuel loading, extend the fuel modified area with a variety of thinning and pruning actions.

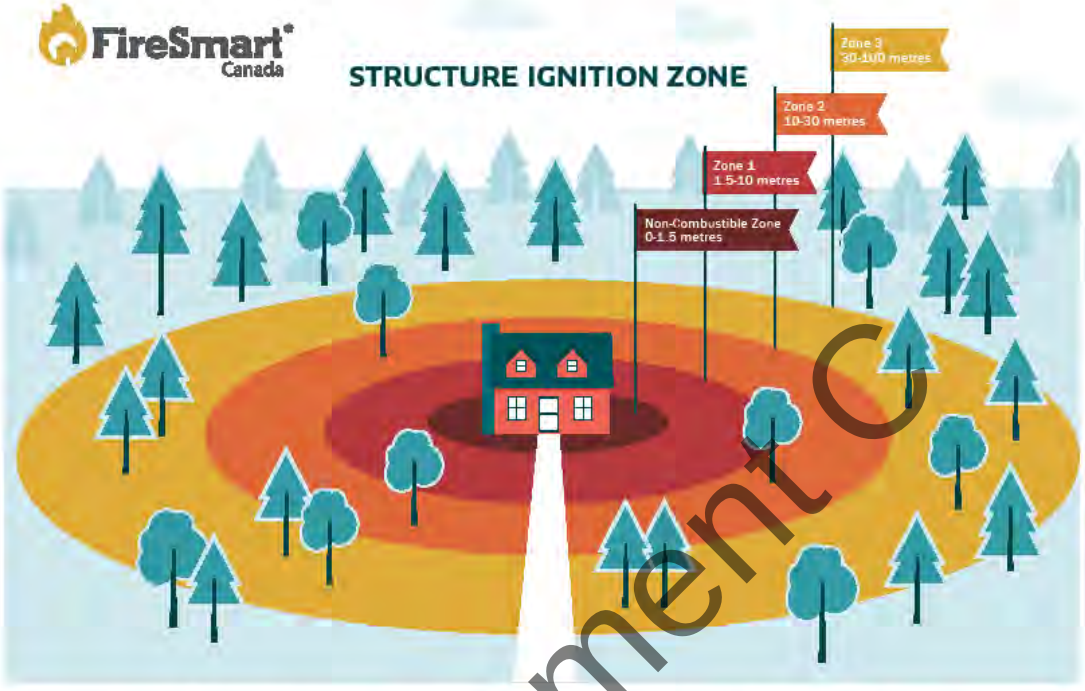
**Zone 3 (30-100 m)**: Where fuel modification in PZ1 and PZ2 is insufficient to protect structures and/or property, FireSmart advocates treatment in Priority Zone 3 with a variety of thinning and pruning actions in order to create an environment that will not support high-intensity crown fires.

*Setback Zone distances may be extended depending on aspect, slope, fuel loading, etc.



FireSmart Canada

## STRUCTURE IGNITION ZONE




### Work with your neighbours in any overlapping priority zones!

| | |
|---|---|
| **Non-combustible Zone** (0-1.5 metres) | Reduce the chance of wind-blown embers igniting materials near your home. A non-combustible surface should extend around the entire home and any attachments, such as decks. Creating a non-combustible surface can be as easy clearing vegetation and combustible material down to mineral soil. To add to your landscape design, use non-combustible materials such as gravel, brick, or concrete in this critical area adjacent to your home. Woody shrubs, trees or tree branches should be avoided in this zone, any that are present should be properly mitigated. |
| **Zone 1** (1.5-10 metres) | Create a landscape that will not easily transmit fire to the home. A FireSmart yard includes making smart choices for your plants, shrubs, grass and mulch. Selecting fire-resistant plants and materials can increase the likelihood of your home surviving a wildfire. Plant a low density of fire-resistant plants and shrubs. Avoid having any woody debris, including mulch, as it provides potential places for fires to start. Storing items such as firewood piles, construction materials, patio furniture, tools and decorative pieces against or near a house is a major fire hazard. Move firewood piles, trailers/ recreational vehicles, storage sheds and other combustible structures out of this zone and into Zone 2. If unable to move, store firewood inside your mitigated garage, shed or other ember resistant structures, create a non-combustible zone underneath and for 1.5 metres around trailers/ vehicles and mitigate sheds and other structures to the same standards as those of your home. |
| **Zone 2** (10-30 metres) | If your property extends out to this zone, thin and prune evergreen trees to reduce hazard in this area. Within 30 metres of your home, selectively remove evergreen trees to create at least 3 metres of horizontal space between the single or grouped tree crowns and remove all branches to a height of 2 metres from the ground on the remaining evergreen trees. If possible, pruning trees up to 100 metres from your home (Zone 3) is recommended. Regularly clean up accumulations of fallen branches, dry grass and needles from on the ground to eliminate potential surface fuels. Consider seeking the guidance of a forest professional with wildland fire knowledge on appropriate management options for this zone. |
| **Zone 3** (30-100 metres) | Taking FireSmart actions in Zone 3 on your property will influence how a wildfire approaches your home. You can change the dynamics of wildfire behaviour by managing vegetation within this zone. Look for opportunities to create a fire break by creating space between trees and other potentially flammable vegetation. Thinning and pruning is effective here as well. These actions will help reduce the intensity of a wildfire. Consider seeking the guidance of a forest professional with wildland fire knowledge on appropriate management options for this zone. |

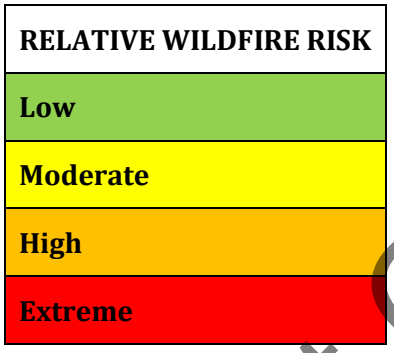
BRITISH COLUMBIA FireSmart

**Begins at Home**

## Appendix 2. Generic Fuel Types (adopted from CFFDRS).

| Fuel Type | Description | Wildfire Behaviour Under High Wildfire Danger |
|---|---|---|
| **Coniferous:** | | |
| **C1** | **Terrestrial herbaceous ecosystem: mossy rock outcroppings** | High potential for surface fire, especially if high moss/lichen |
| **C2** | **Dense regeneration to pole-sapling (immature) forest with crowns almost to ground** | High potential for crown fires; low to very high fire intensity and rate of spread |
| **C3** | **Fully stocked, mature forest, crowns separated from ground; sparse understorey** | Surface and crown fire, low to very high fire intensity and rate of spread |
| **C4** | **Dense, pole-sapling (immature) forest, heavy standing dead and down, dead woody fuel; continuous needle litter; continuous vertical crown fuel continuity** | High potential for crown fires, high to very high fire intensity and rate of spread |
| **C5** | **Moderately well-stocked, mature forest, moderate dense understorey crowns well separated from ground; continuous needle litter** | Low to moderately fast-spreading, low to moderate intensity surface fire |
| **C6** | **Fully stocked conifer plantation; absent understorey; tree crowns separated from ground; continuous needle litter** | Surface fire may spread rapidly to become high intensity fire with high rate of spread |
| **C7** | **Open, mature coniferous stand; uneven-aged; discontinuous understorey; tree crowns mostly separated from ground** | Surface, torching, rarely crowning (except on steeper slopes), moderate to high intensity and rate of spread |
| **D (Deciduous)** | **Moderately well-stocked deciduous stands; moderate medium to tall shrubs and herb layers**<br>**D-1 Leafless**<br>**D-2 In leaf** | Typically a surface fire; low to moderate rate of spread and fire intensity |
| **M (Mixed Forest)** | **Moderately well-stocked mixed stand of conifers and deciduous tree species; moderate shrub understorey; conifer crowns extend nearly to ground**<br>**M-1 Leafless**<br>**M-2 in Leaf** | Surface, torching and crowning; moderate to very high intensity and spread rate (varies with slope and % vegetation cover)<br>Fine fuel % and cedar foliage retention will result in faster ignition and spread |
| **S (Slash)** | **Slash from logging and land clearing** | Rapid spreading, moderate to high intensity surface fire |
| **01-Long** | **Continuous standing grass – fuel loading is 0.3 kg/m2; scattered trees**<br>**01-a Matted**<br>**01-b Tall** | The taller, and more cured the grass, the more rapid spread; low to moderate intensity surface fire |
| **01-Short** | **Continuous human modified short grass** | Typically low rate and spread and low fire intensity. |

## Appendix 3. Fire Risk Classes.






### Fire Risk Classes

**Low (Green):** The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it a lower potential for threatening a community. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle in extreme fire weather conditions. Fuel type spot potential is very low, low risk to any values at risk.

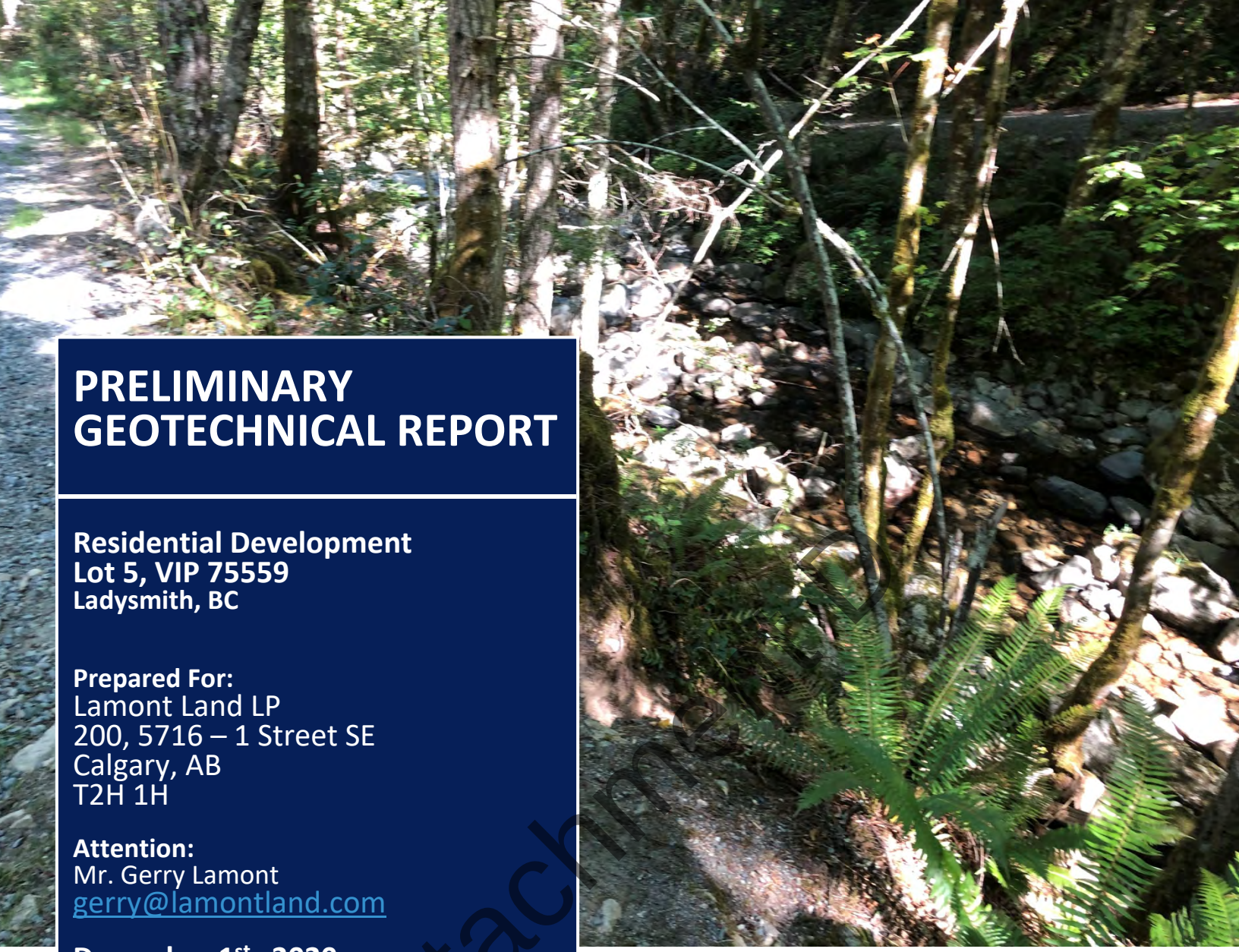
**Moderate (Yellow):** The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns and known local wildfire threat factors make it possible that a wildfire in this area would threaten the community. Areas of matted grass, slash, conifer plantations, mature conifer stands with very high crown base height, and deciduous stands with 26 to 49% conifers. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle. Rates of spread would average between 2-5 meters/ minute. Forest stands would have potential to impact values in extreme weather conditions. Fuel type spot potential is unlikely to impact values at a long distance (<400m).

**High (Orange):** The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it likely that a wildfire in this area would threaten the community. This includes stands with continuous surface/ crown fuel that will support regular torching/ candling, intermittent crown and/or continuous crown fires. Rates of spread would average 6 -10 meters/ minute. Fuel type spot potential is likely to impact values at a long distance (400 -1 000m).

**Extreme (Red):** The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it very likely that a wildfire in this area would threaten the community. Stands with continuous surface/ crown fuel and fuel characteristics that tend to support the development of intermittent or continuous crown fires. Rates of spread would average >10 meters/ minute. Fuel type spot potential is probable to impact values at a long distance (400 -1 000m or greater).These forest stands have the greater potential to produce extreme fire behaviour (long range spotting, fire whirls and other fire behaviour phenomena.

*Limitations*

*This report provides an assessment of site conditions. Evaluation is based on professional judgment. The investigation involved field observation. Recommended treatment pertains only to the particular site as disclosed at the time of inspection. The report was prepared considering site-specific circumstances and conditions. It is intended only for use by the client for the purpose for which it was commissioned and for use by local government regulating the activities to which it pertains.*



# PRELIMINARY GEOTECHNICAL REPORT

**Residential Development**
**Lot 5, VIP 75559**
**Ladysmith, BC**

**Prepared For:**
Lamont Land LP
200, 5716 – 1 Street SE
Calgary, AB
T2H 1H

**Attention:**
Mr. Gerry Lamont
gerry@lamontland.com

**December 1st , 2020**



File No.: F8630.02
Revision No.: 00
Prepared by: John Hessels, AScT
Chris Hudec, M.A.Sc., P.Eng.

Lewkowich Engineering Associates Ltd.
1900 Boxwood Road
Nanaimo, BC, V9S 5Y2
250-756-0355 (Office)
250-756-3831 (Fax)
www.lewkowich.com
geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

OQM CERTIFIED

## DISCLAIMER

1. Lewkowich Engineering Associates Ltd. (LEA) acknowledges that this report, from this point forward referred to as "the Report," may be used by the Town of Ladysmith as a precondition to the issuance of development and/or building permits and that this Report and any conditions contained therein may be included in a restrictive covenant under Section 56 of the Community Charter and registered against the title of the property at the discretion of the ToL.
2. This Report has been prepared in accordance with standard geotechnical engineering practice solely for and at the expense of Lamont Land Inc. We have not acted for or as an agent of the ToL in the preparation of this Report.
3. The conclusions and recommendations submitted in this Report are based upon information from a desktop study, limited subsurface investigation and a visual site-assessment of the property during the preparation of this Report. No other warrantee, expressed or implied, is made. If unanticipated conditions become known during future residential construction or other information pertinent to the structure(s) becomes available, the recommendations may be altered or modified in writing by the undersigned.
4. The conclusions and recommendations issued in this Report are valid for a maximum of two (2) years from the date of issue. The 2-year term may be reduced as a result of updated bylaws, policies, or requirements by the authority having jurisdiction, or by updates to the British Columbia Building Code. Updates to professional practice guidelines may also impact the 2-year term. If no application of the findings in this Report have been made to the subject development, the conclusions issued in this Report become void and re-assessment of the property will be required.
5. This Report has been prepared by Mr. John Hessels, AScT and by Mr. Chris Hudec, M.A.Sc., P.Eng. Messrs. Hessels and Hudec are both adequately experienced and are also members in good standing with their respective associations, Mr. Hessels with the Applied Science Technologists & Technicians of British Columbia (ASTTBC), and Mr. Hudec with the Engineers and Geoscientists of British Columbia (EGBC).

# EXECUTIVE SUMMARY

1. The following is a brief synopsis of the property, assessment methods, and findings presented in the Report. The reader must read the Report in its entirety; the reader shall not rely solely on the information provided in this summary.
2. The subject development area is located on the east coast of Vancouver Island and in west central portion and jurisdictional limits of the Town of Ladysmith. The proposed development at the time of this report consists of residential development of the 44 acre parcel which will include a new crossing over Holland Creek to gain access to the parcel for future residential development considerations (by others).
3. We understand the crossing details are nearly complete and include a large structural plate arch with two pedestrian tunnels (one each side of creek) and associated MSE type retaining walls and civil works.
4. The assessment methodology includes a desktop study of the area geology, crossing design details and reports as well a review of nearby projects. In additional a limited subsurface investigation was completed by means of a series of testpits over the development area.
5. The site assessment shows that the proposed development concept is considered suitable for the intended purpose as long as the recommendations given here are followed.



**List of Abbreviations Used in the Report**

| Abbreviation | Title |
|---|---|
| LEA | Lewkowich Engineering Associates Ltd. |
| TOL | Town of Ladysmith |
| ASTTBC | Applied Science Technologist and Technicians of BC |
| EGBC | Engineers and Geoscientists of British Columbia |
| MSE | Mechanically Stabilized Earthen |
| GIT | Geologist in Training |
| OCP | Official Community Plan |
| DPA | Development Permit Area |
| MOTI | Ministry of Transportation and Infrastructure |

# TABLE OF CONTENTS

# 1.0 INTRODUCTION

## 1.1 General

a. As requested, Lewkowich Engineering Associates Ltd. (LEA) has carried out an assessment of the subject lands and prepared this report as per the local government regulations for residential land development. This report provides a summary of our findings, recommendations, and general design information

b. We understand the proposed development includes a substantial structure to cross Holland Creek and gain access to the development lands. The structure design, including geotechnical design parameters, has been completed by others. The subject parcel is primarily bedrock based and contains slopes in excess of 30% as well as some surficial sand and gravel soils (Alluvial, Glacial Till).

## 1.2 Assessment Methodology

a. A limited subsurface investigation was carried out as part of our review that included a series of five (5) testpits located along accessible gravel roadways through the property. All testpits were backfilled upon completion. The field review was carried out by Mr. TJ Hamre, GIT, of LEA on October 6 and 7, 2020, to detail the subsurface soils within the proposed development area

b. A desktop study was also completed that includes a review of all documents relating to the creek crossing, nearby developments, as well as surficial and bedrock mapping.

c. Our evaluation referenced the EGBC Guidelines for legislated landslide assessments for proposed residential developments in BC (May 2010). Briefly, these guidelines stipulate that the report is to identify natural hazards that may affect the "safe" development of the land, and to provide recommendations to reduce the risk of damage to the land, buildings, and the Works and Services.



# 2.0 SITE CONDITIONS

## 2.1 Physical Setting

a. The Property is located in the south end of the Town of Ladysmith and is identified with the following civic and legal address:

   i. Lot 5, VIP75559, Ladysmith, BC.

b. The Property is generally rectangular in shape and is bordered by Holland Creek to the north and west and undeveloped property to the east and south.

c. See Figure 2.1 below for property location.




**Figure 2.1 – Location Plan of Subject Property**

d. Based on our desktop review of the ToL OCP[1,3], the Property is located within a development permit area (DPA) 6 Riparian[2].

## 2.2 Terrain, Features and Soils

a. The sites terrain is varied throughout the parcel, but is generally less steep over the northern half of the property where single family parcels are planned, with the steeper section to the southwest containing the multi-family zone and the steepest section to the south and east destined to remain undeveloped as park land. The parcel is generally covered in a moderate to thick growth of evergreen and deciduous trees with

thick low lying vegetation with numerous bedrock protrusions throughout. The area shows past logging activities (large stumps, haul roads and skidder trails.). The Holland Creek corridor is incised into the surficial mantle of soils leaving very coarse gravel / cobble bottom and steep creek banks to the surrounding ground.

b. The site soils consisted of an average 0.8m thickness of silty, sand and gravel mixed with organics (root zone), underlain by a sandy gravel, to course cobble, with trace silt zone that varied from 1.0m to 3m thick underlain by very dense silty glacial till and/or bedrock.

c. The site does contain significant sands and gravel, cobbles layers up to 3m thick in dipping areas between bedrock protrusions. Mostly located in the areas of testpits 3, 4 and 5 which were investigated deeper to help determine depth of deposits. The excavated material was variable changing from mostly sand to very coarse materials cobble to boulder. This material would be considered suitable for bulk filling with a regiment of mixing and screening of pieces larger than 300mm. Additional screening could also provide a product conducive to a MOTI, SGSB type specification.

d. Soil classification terminology is based on the Modified Unified classification system. The relative proportions of the major and minor soil constituents are indicated by the use of appropriate Group Names as provided in ASTM D2487 Figures 1a, 1b, and 2. Other descriptive terms generally follow conventions of the Canadian Foundation Engineering Manual

## 2.3 Regional Geology

a. The Surficial geology for the area[4] is classified as having glaciofluvial sediments, comprised of sand and gravel deposits related to outwash from previous glaciations.

b. Bedrock geology for the area[5] is classified as undivided sedimentary rocks of the Upper Cretaceous, Nanaimo Group, although, at this site, igneous basaltic rock was encountered in contradiction to the bedrock mapping (i.e. not low lying area).

## 2.4 Groundwater Conditions

a. No seepage zones were encountered in the testpits, soils were generally in a moist condition throughout. We do expect heavy seepage within the development in areas where the very permeable soils thin out to near surface or are encountered during grade manipulation and servicing (trenching) activities. Generally, the near surface water perch on the impermeable mantle of rock and or very dense silty glacial till.

b. Groundwater levels can be expected to fluctuate seasonally with cycles of precipitation. Groundwater conditions at other times and locations can differ from those observed during the course of subdivision construction.

## 2.5 Seismic Considerations

No compressible or liquefiable soils were identified during our assessment. No large scale, catastrophic soil slippage, landslides from local mountainsides where noted within the subject parcel. Minor erosion events typically coincident with ground disturbance (old logging road/ culverts) and /or tree fall were noticed on steeper sections.

## 2.6 Slope Setbacks

The topographic review indicated some steep slope sections within the development areas. Once detailed plans are made available, a subsequent review should be conducted to establish setbacks, rock fall zones and grading measures and/or walls prior to final detail designs.

## 2.7 Seismic Considerations

Based on the 2018 British Columbia Building Code, Division B Part 4 Table 4.1.8.4.A "Site Classification for Seismic Site Response," the soils and strata encountered during our involvement with the project to date are categorized as "Site Class C" (Very Dense Soil or Soft Rock).

# 3.0 CONCLUSIONS

## 3.1 Local Government Conformance Statement

From a geotechnical point of view, and provided the recommendations in this Report are followed, the land is considered safe for the use intended (defined for the purposes of this Report as a residential development), with the probability of a geotechnical failure resulting in property damage of less than:

i. 2% in 50 years for geotechnical hazards due to seismic events, including slope stability; and,

ii. 10% in 50 years for all other geotechnical hazards.

## 3.2 Acknowledgements

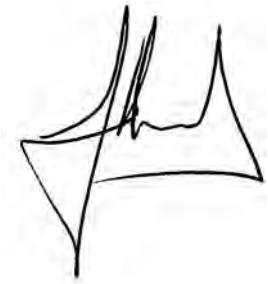
a. Lewkowich Engineering Associates Ltd. acknowledges that this Report may be requested by the building inspector (or equivalent) of the Town of Ladysmith as a precondition to the issuance of a development permit. It is acknowledged that the Approving Officers and Building Officials may rely on this Report when making a decision on application for development of the land. We acknowledge that this Report has been prepared solely for, and at the expense of Lamont Land LP.

b. We have not acted for or as an agent of the Town of Ladysmith in the preparation of this Report. We acknowledge the Town of Ladysmith and the Approving Officer(s) are authorized users of this Report.

# 4.0 CLOSURE

Lewkowich Engineering Associates Ltd. appreciates the opportunity to be of service on this project. If you have any comments, or additional requirements at this time, please contact us at your convenience.

Respectfully Submitted,
Lewkowich Engineering Associates Ltd.




2020-12-01

John Hessels, AScT
Senior Technologist

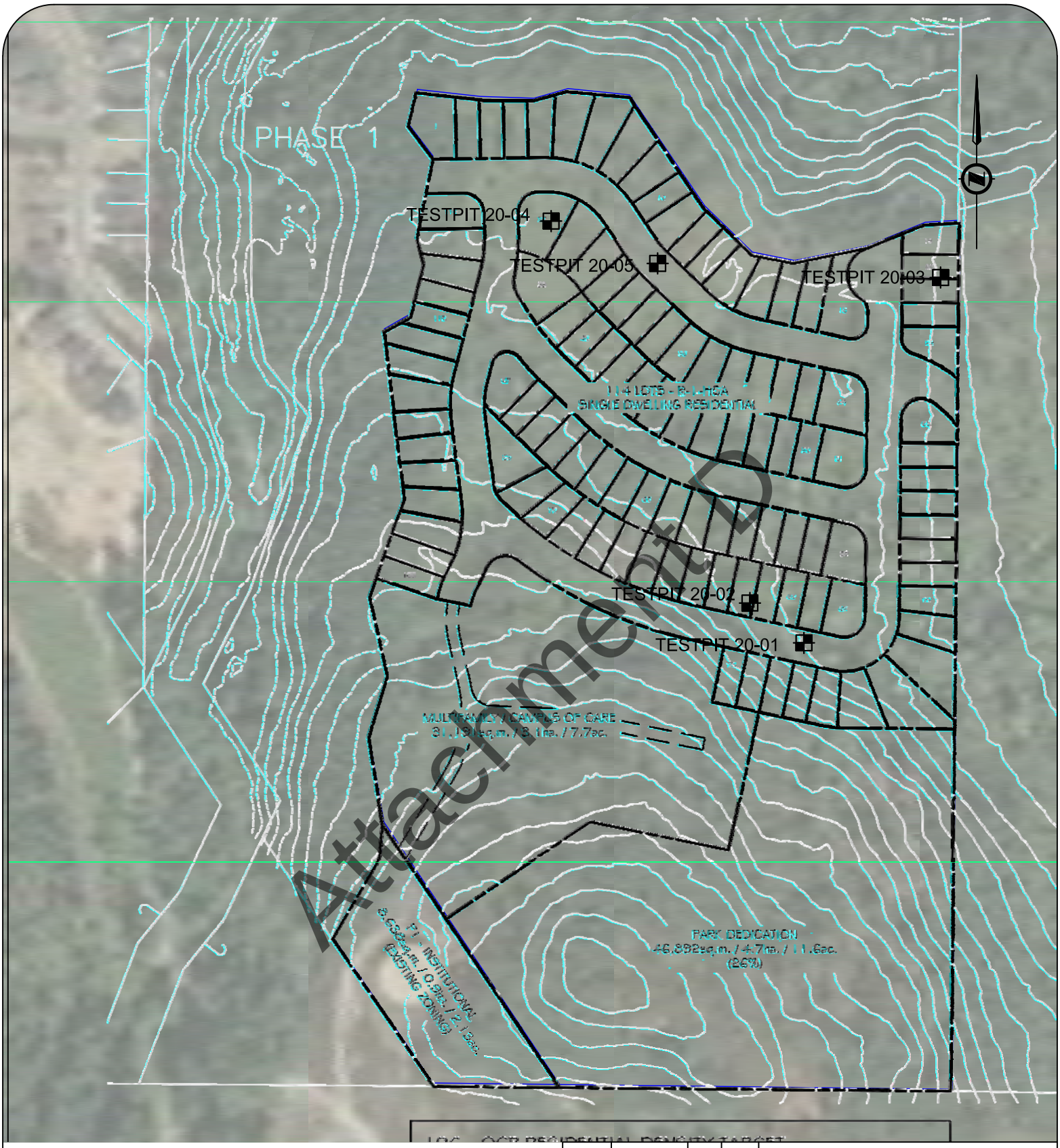
Chris Hudec, M.A.Sc., P.Eng.
Senior Project Engineer

# 5.0 ATTACHMENTS

1. Lewkowich Engineering Associates Drawing F8630-01 "Test Pit Site Plan", November 26th, 2020
2. Lewkowich Engineering Associates, "Test Pit Logs" (5), October 13th, 2020

# 6.0 REFERENCES

1. Town of Ladysmith map titled "Official Community Plan, Map 1, Land Use," Dated September 18, 2018.
2. Town of Ladysmith map titled "Official Community Plan, Map 2, Development Permit Areas," Dated September 18, 2018.
3. Town of Ladysmith "Holland Creek Local Area Plan" Schedule C of the Town of Ladysmith Official Community Plan Dated September 18, 2018.
4. Ministry of Environment Mapping, Produced by R.H. Guthrie and C.R. Penner, titled "Vancouver Island Geology."
5. Geoscience BC map titled "Map 2013-NVI-1-1, Geology, Northern Vancouver Island Project," Dated January 2013.
6. "Flood Hazard Area Land Use Management Guidelines" May 2004; Ministry of Water, Land and Air Protection, Province of British Columbia. Amended by: Ministry of Forests, Lands, Natural Resource Operations and Rural Development, January 1, 2018.
7. Riparian area Regulation Section 3.7.3 to 3.8.2




| REV No. | DATE | BY | P.Eng. | REVISION DESCRIPTION |
|---|---|---|---|---|
| | | | | |

| | | | |
|---|---|---|---|
| DRAWING TITLE: TESTPIT SITE PLAN | ENGINEER'S SEAL | PLOT DATE: Nov. 26 -20 | DRAWN BY: JH |
| PROJECT NAME: RESIDENTIAL DEVELOPMENT NANAIMO, BC | | REVIEWED BY: SC | SCALE: 1:300 |
| LEGAL DESCRIPTION: LOT 5 VIP75559 | | PROJECT No.: F8630 | DRAWING No.: F8630-01 |

LEA
Lewkowich Engineering Associates Ltd.

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

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Project: Lot 5 - VIP75559
Location: Ladysmith, BC

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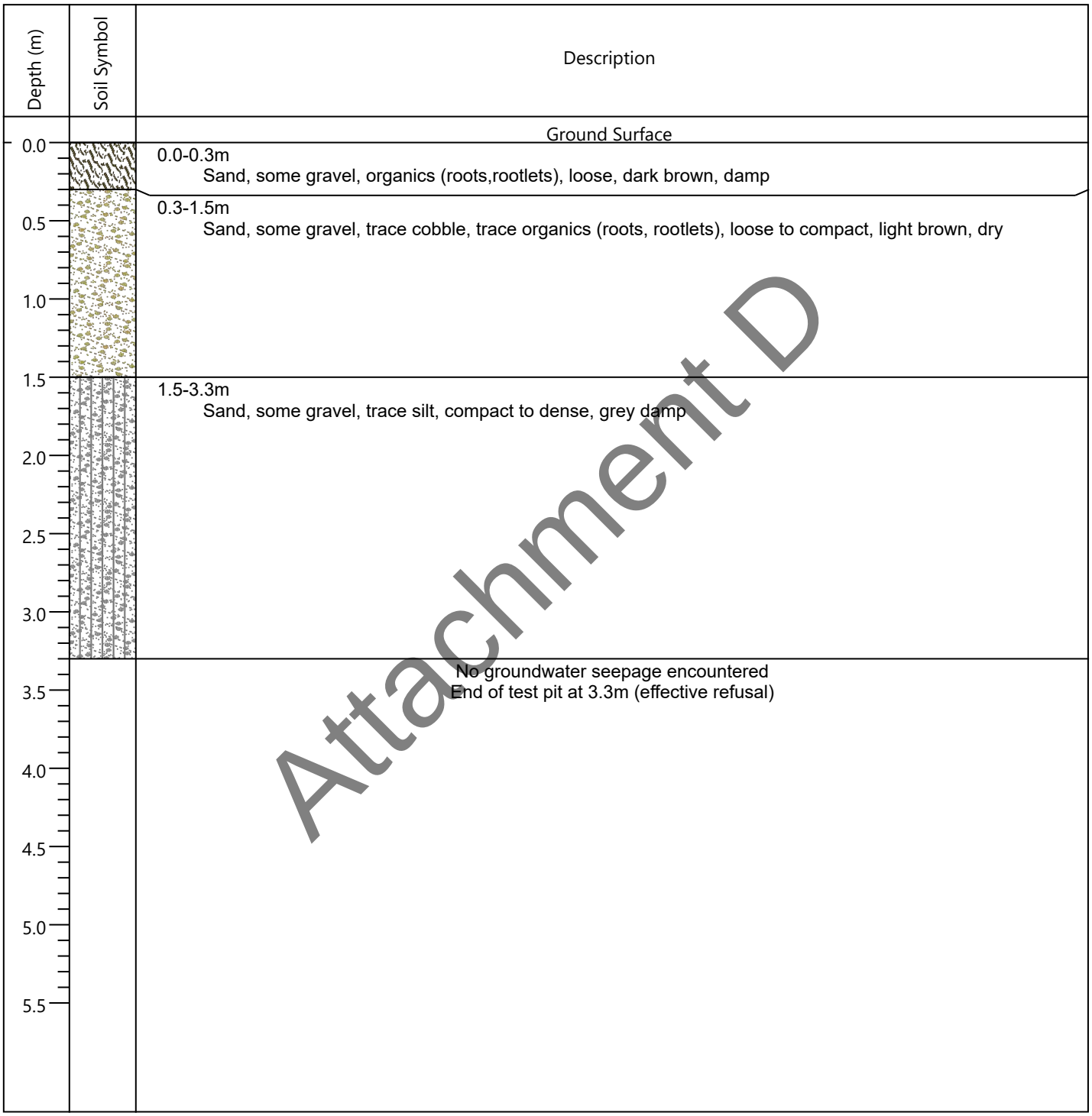




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Reviewed By: JS
Digging Method: Cat 330CL

Date: October 13, 2020
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1900 Boxwood Road
Nanaimo, BC V9S 5Y2
Phone: (250)-756-0355
Fax: (250)-756-3831
Email: geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

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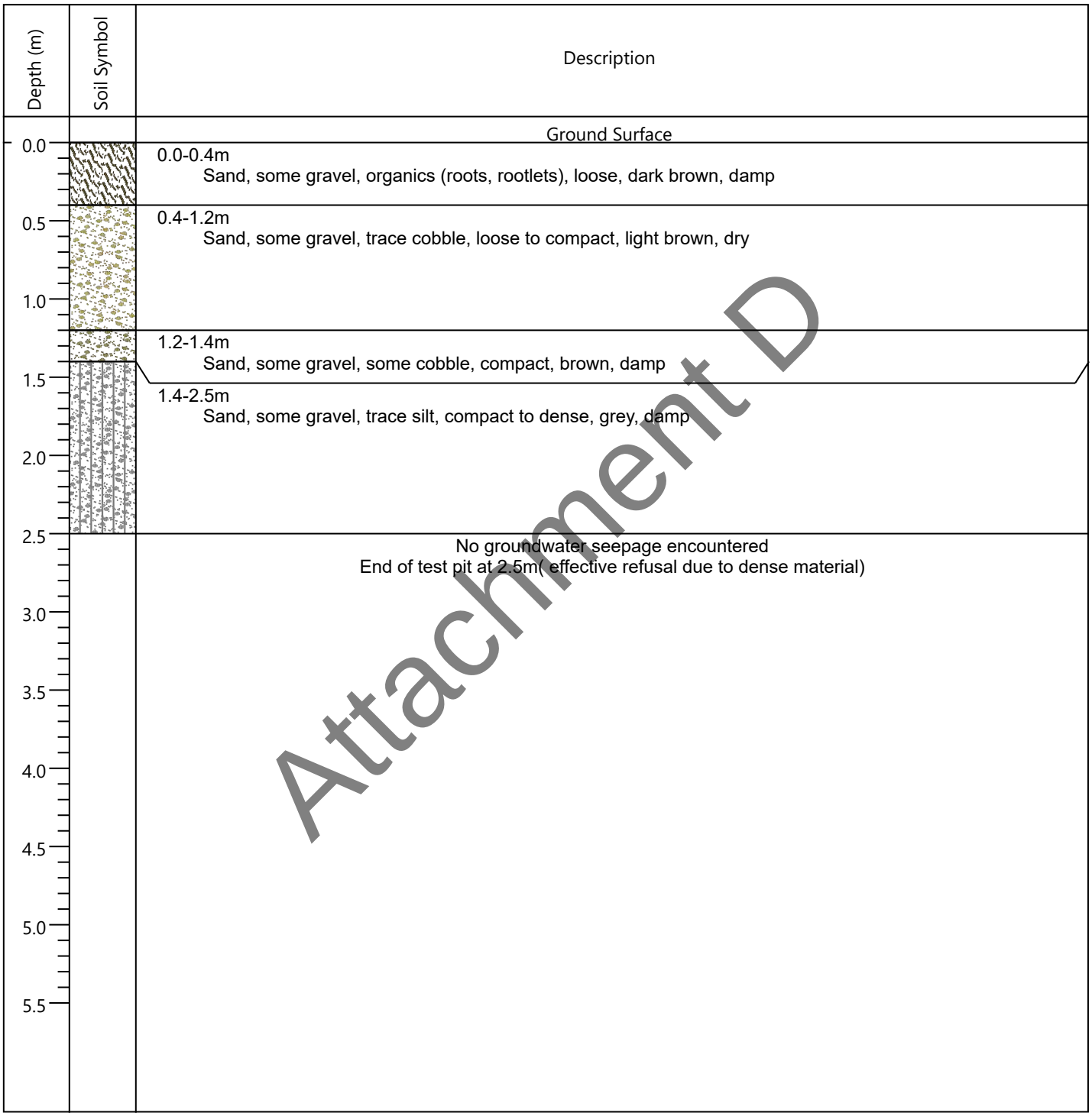




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Nanaimo, BC V9S 5Y2
Phone: (250)-756-0355
Fax: (250)-756-3831
Email: geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

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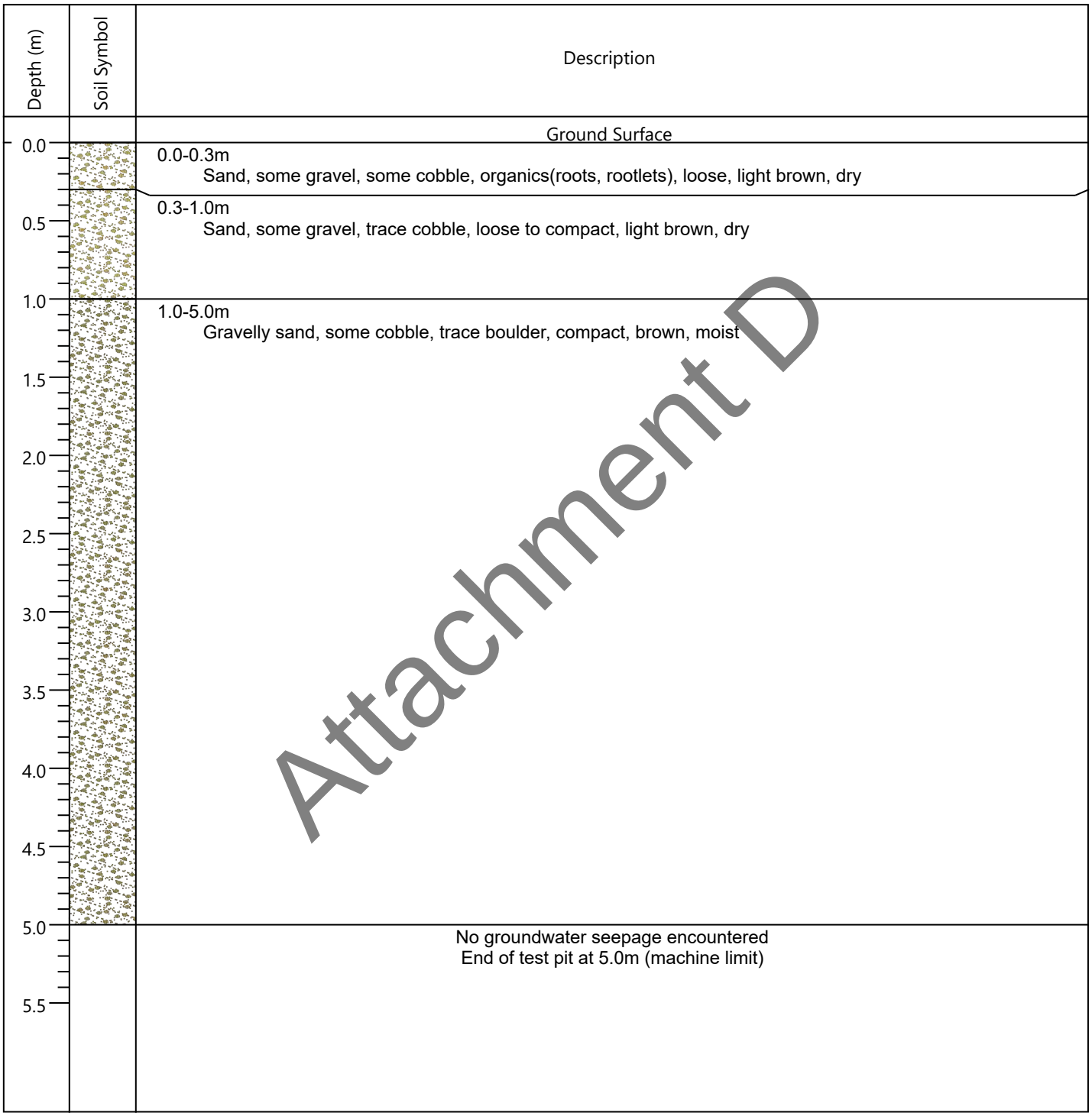




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Phone: (250)-756-0355
Fax: (250)-756-3831
Email: geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

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Project: Lot 5 - VIP75559
Location: Ladysmith, BC

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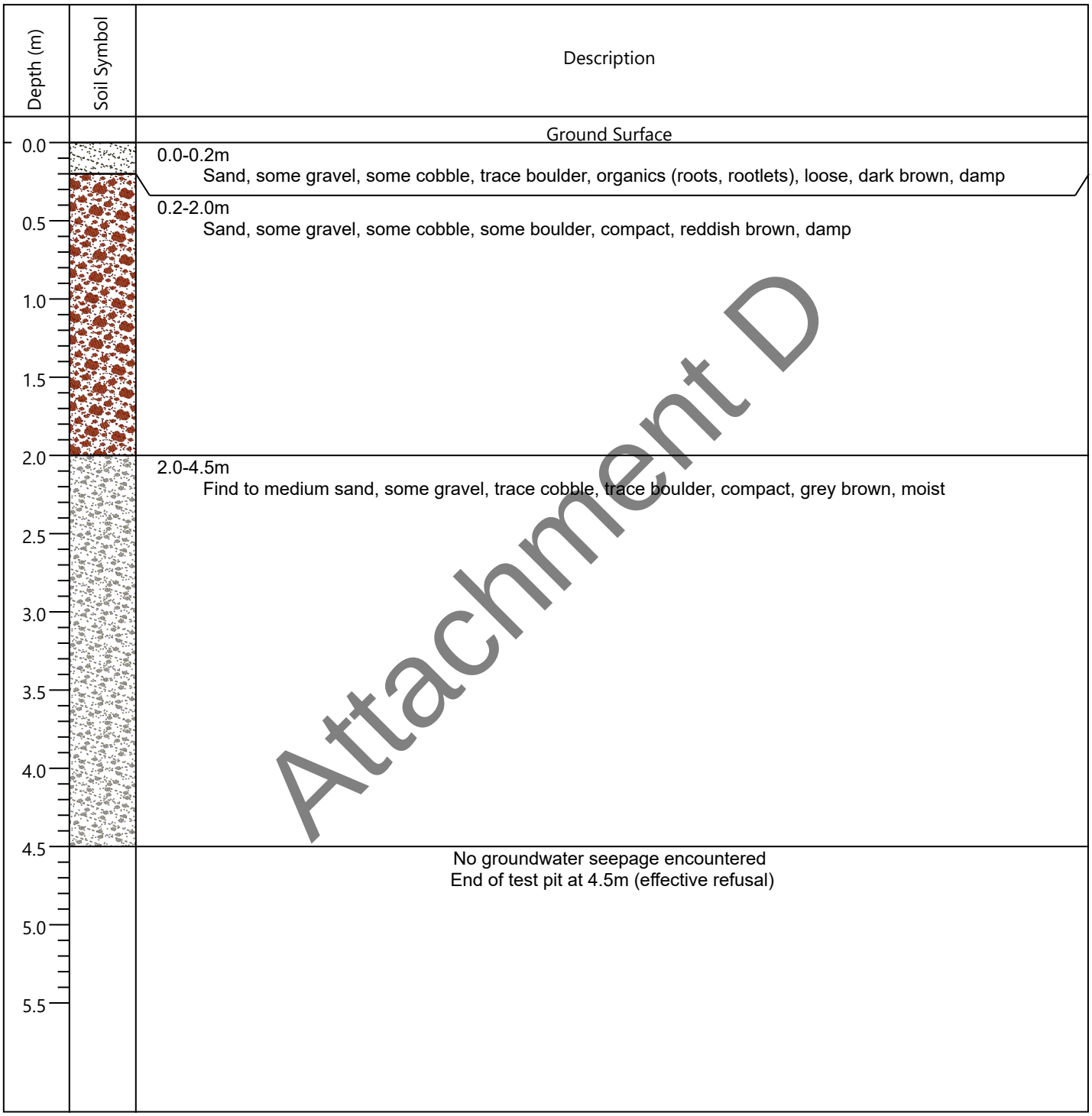




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Nanaimo, BC V9S 5Y2
Phone: (250)-756-0355
Fax: (250)-756-3831
Email: geotech@lewkowich.com

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# TEST PIT LOG

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Project: Lot 5 - VIP75559
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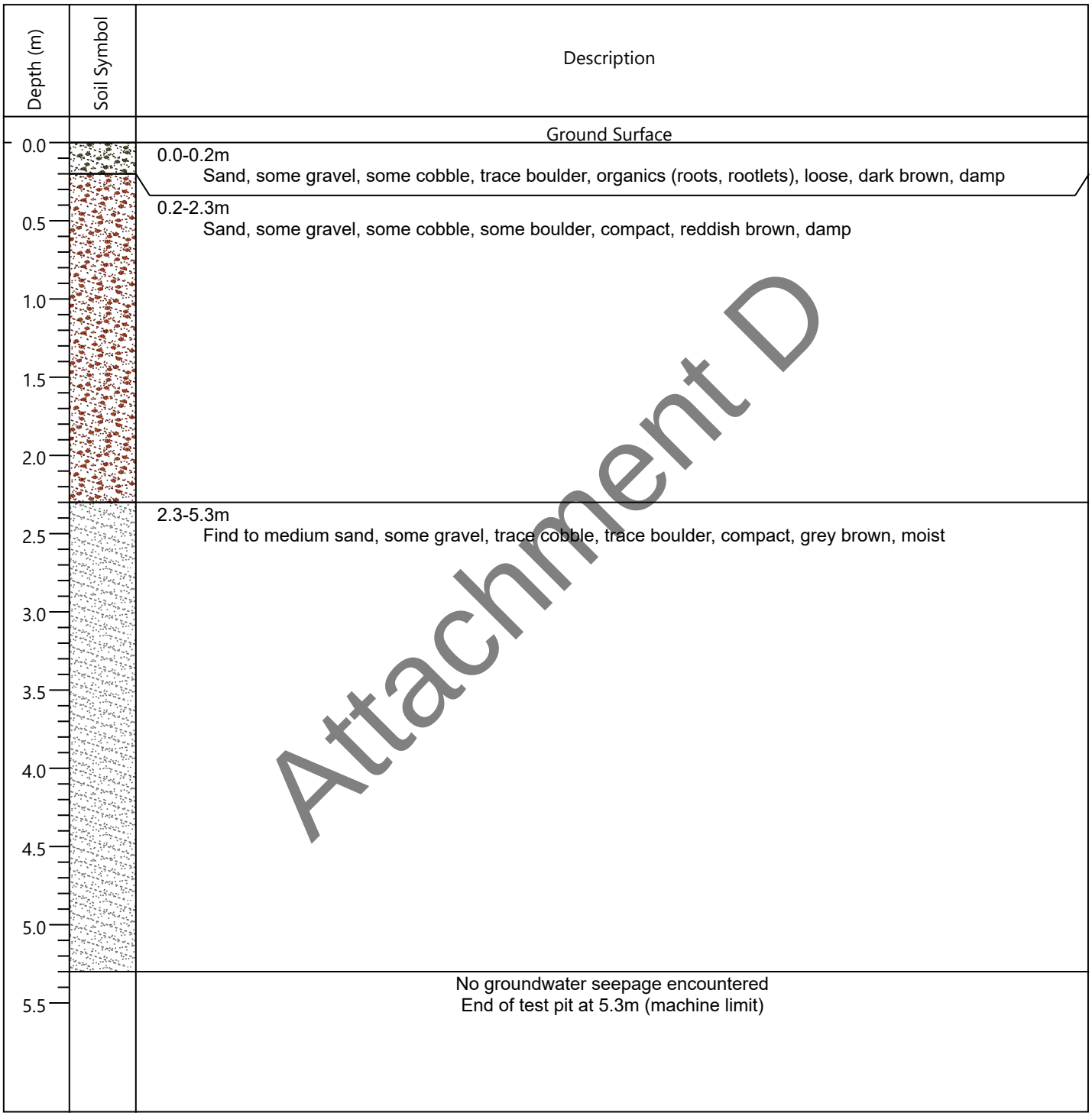




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