Comox Valley REGIONAL DISTRICT

Staff report

DATE: August 2, 2018

FILE: 3060-20 / DP 13B 18

TO: Chair and Directors
Electoral Areas Services Committee

FROM: Russell Dyson
Chief Administrative Officer

Supported by Russell Dyson
Chief Administrative Officer

R. Dyson

RE: **Shoreline Protection Devices and Steep Slopes Development Permit**
Lazo North (Electoral Area B)
955 Balmoral Road (Renooy)
Lot 1, District Lot 140, Comox District, Plan 4043 Except that Part in Plan 16734, PID 006-149-341

Purpose
To consider a Shoreline Protection Devices and Steep Slopes Development Permit (DP) for repair of a hard shoreline protection device (rock revetment wall) at the toe of Willemar Bluff (Appendix A).

Recommendation from the Chief Administrative Officer:
THAT the board approve the Shoreline Protection Devices and Steep Slopes Development Permit DP 13B 18 (Renooy) for the property described as Lot 1, District Lot 140, Comox District, Plan 4043 Except that Part in Plan 16734 (955 Balmoral Road) for repairs to an existing shoreline protection device;

AND FURTHER THAT the Corporate Legislative Officer be authorized to execute the permit.

Executive Summary
- The subject property borders Willemar Bluff and the Strait of Georgia. The toe of the steep embankment is currently armoured with a rock revetment wall for the purpose of shoreline protection.
- The shoreline protection device was damaged when a tree slid down the embankment. The applicants propose to repair the damaged portion by excavating a small trench, lining it with non-woven geotextile, filling it with bedding rock and installing riprap.
- The coastal engineering report notes that there should be no impacts on adjacent properties (also with rock revetment walls) due to the repairs being located behind the existing riprap and away from the property boundary.
- The impact of the proposed shoreline protection repairs on the steep slope were reviewed by a geotechnical engineer. The engineer concluded that the repairs will help promote slope stability.
- To mitigate environmental impacts, the Qualified Environmental Professional (QEP) has indicated that a forage fish survey will be required to determine the construction window. If the applicants follow the construction best practices, no impacts on the marine environment are anticipated.
- Provided the applicants follow the recommendations in the QEP report, engineering reports and permit, the issuance of the Shoreline Protection Devices and Steep Slopes DP is supportable.

Prepared by:	Concurrence:
B. Labute	***A. Mullaly***
Brianne Labute Planner	Alana Mullaly, M.Pl., MCIP, RPP Acting General Manager of Planning and Development Services Branch

Stakeholder Distribution (Upon Agenda Publication)

Applicants	✔

Background/Current Situation

An application has been received to consider a Shoreline Protection Devices and Steep Slopes DP for repairs to an existing rock revetment wall. The subject property is 0.97 hectares in size and is surrounded by residential properties to the west and east, Balmoral Road to the north and the Georgia Strait (Willemar Bluff) to the south (Figure 1 and 2). The property is developed with a single detached dwelling and garage. A portion of the shoreline protection device was damaged last winter when a tree slid down the steep embankment. Once the tree was at the base of the slope the wave action began to flatten the rock slope and exposed the toe of the steep sand bluff to wave action. If the shoreline protection device is not repaired, the property will be susceptible to erosion. Machinery will access the shoreline protection device via Cardem Road and will travel approximate 1 kilometer along the foreshore to the subject property. The owners have received approval from the Ministry of Transportation and Infrastructure to load/unload equipment and materials within the Cardem Road right of way.

Due to the archaeological potential in the area, the applicants submitted an Archaeological Assessment dated March 13, 2018, prepared by Owen Grant, BA of Baseline Archaeological Services Ltd (Appendix A). The report concluded the site has low archaeological potential and no further studies are recommended.

Official Community Plan Analysis

Implemented through the use of DPs, the Official Community Plan (OCP), Bylaw No. 337 being the "Rural Comox Valley Official Community Plan Bylaw No. 337, 2014", contains specific policies to protect, restore and enhance coastal shorelines and the marine environment; to create hazard resilient communities whereby people and natural systems can better withstand future stresses related to hazardous conditions; and to consider the impacts of any structural interventions on the natural processes related to a noted hazard. Proposals need to meet the objectives and guidelines of the Development Permit Area (DPA) to be consistent with the OCP.

Shoreline Protection Development Permit

Section 83 of the OCP requires a Shoreline Protection Devices DP for repairs to a shoreline protection device. To support the application, the applicants submitted a Coastal Engineering Report dated June 27, 2018, prepared by Jim Mitchell, P. Eng of Emerald Sea Engineering (Appendix A). The report concludes that repairs to the breached portion of the riprap are imperative as the toe of the slope has been exposed and is subject to erosion. The bluff is already overly steep and overhanging at the top. The report takes into account sea level rise, geological lift, tidal water levels and estimated wave height and recommends the breach is repaired by excavating a small trench, lining it with non-woven geotextile, filling it with bedding rock and installing riprap (Figure 3). The repairs are located away from the property boundary and behind the existing rock, therefore, the works are not expected to have an impact on adjacent properties.

To address environmental impacts, the applicants submitted a Biophysical Assessment dated July 24, 2018, prepared by Rupert Wong, R.P. Bio and Danika Wong, Tech (Appendix A). The QEP report notes that the area of proposed work is below the high water mark, therefore, a Department of Fisheries and Oceans (DFO) Request for Review is not required. The main concern is the herring spawn area. Prior to commencing the shoreline protection repairs, the applicants must contact Current Environmental to conduct a forage fish survey, which is valid for seven days. DFO establishes the fisheries window with the least risk as June 1 to September 1 and December 1 to February 15. If works are completed outside this window, it is the responsibility of the applicants to ensure works do not contravene Section 35 of the *Fisheries Act* prohibition against serious harm to fish (Appendix A). The QEP provided a series of best practices for working in the intertidal area (sediment and erosion control, spill response, etc) and concludes if the recommendations in the report are followed no harm to the marine environment is anticipated. Revegetation of the upland area adjacent to the bluff with native species is recommended to provide a vegetative buffer for the steep slope, help restrict pedestrian access, reduce the spread of invasive species and improve habitat function. It is not recommended that invasive species in close proximity to the slope are removed for safety reasons.

Steep Slopes Development Permit

As per Section 84 of the OCP, shoreline protection works within 7.5 metres of a steep slope triggers a steep slope DP. The applicants have submitted a Geotechnical Report dated July 16, 2018, prepared by J. Fischer, P.Eng and Chris Hudec, P. Eng of Lewkowich Engineering Associated Ltd (Appendix A). The authors reviewed the shoreline protection design prepared by Jim Mitchell, P. Eng and have no objections from a geotechnical perspective. The report notes that repairs to the existing rock revetment wall will promote slope stability by mitigating undermining of the toe caused by wave action. The geotechnical report also makes recommendations for the proposed dwelling renovations, which are not included in the scope of this staff report as the dwelling is outside the steep slopes DPA.

Policy Analysis

Sections 488 to 491 of the *Local Government Act* (RSBC, 2015, c. 1) (LGA) authorizes a local government to manage different types of development that occur in specific areas. The LGA allows a local government to designate DPAs and to establish guidelines within its OCPs to protect the natural environment and to protect development from hazardous conditions. Pursuant to Part 4, Section 83 of the OCP requires a shoreline protection device DP prior to the repair of a shoreline protection device. If the shoreline protection is adjacent to a steep slopes, a steep slope DP is also required as per Section 84 of the OCP.

Options

The Board could either approve or deny the requested DP. Based on the analysis above, staff recommend the board approve the application.

Financial Factors

Applicable fees have been collected for this application under Bylaw No. 328 being the "Comox Valley Regional District Planning Procedures and Fees Bylaw No. 328, 2014". Pursuant to Bylaw No. 328, a financial performance bond of $775.43 (125 per cent of 620.34) is required to ensure the revegetation is completed in accordance with the QEP's recommendations. The Performance Bond will be released in accordance with Bylaw No. 328.

Legal Factors

This report and the recommendations contained herein are in compliance with the LGA and Comox Valley Regional District (CVRD) bylaws. DPs are permitted in certain circumstances under Sections

488 to 491 of the LGA.

Regional Growth Strategy Implications
The Regional Growth Strategy (RGS) being the "Comox Valley Regional District Regional Growth Strategy Bylaw No. 120, 2010" designates the subject property within Settlement Expansion Areas. Objective 2-B of the RGS aims to *"Frame environmental protection and policies around the principles of precaution, connectivity and restoration."* The principle of precaution requires documentation about the proposed development and impacts on the environment; it may prompt a limit to proposed actions. The applicants have provided a Biophysical Assessment with precautionary measures to ensure the protection of the aquatic area.

Intergovernmental Factors
The repair works associated with this application are within the titled boundary. At a later date, the applicants may apply to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development to complete repairs works on Crown land.

Interdepartmental Involvement
This proposal was referred to applicable internal departments within the CVRD. No concerns were identified. The engineering department notes that *"every effort should be made for the rocks to be carefully individually keyed into place to enhance the stability of the revetment and avoid premature collapse or shifting of rocks which can pose a significant hazard to public safety. An attempt should also be made for the surface of the structure to be as flat as possible, to enhance stability"*.

Citizen/Public Relations
Public notification is not required for a Shoreline Protection Devices or Steep Slopes DP.

Attachments: Appendix A – "Shoreline Protection Devices and Steep Slopes Development Permit – DP 13B 18"

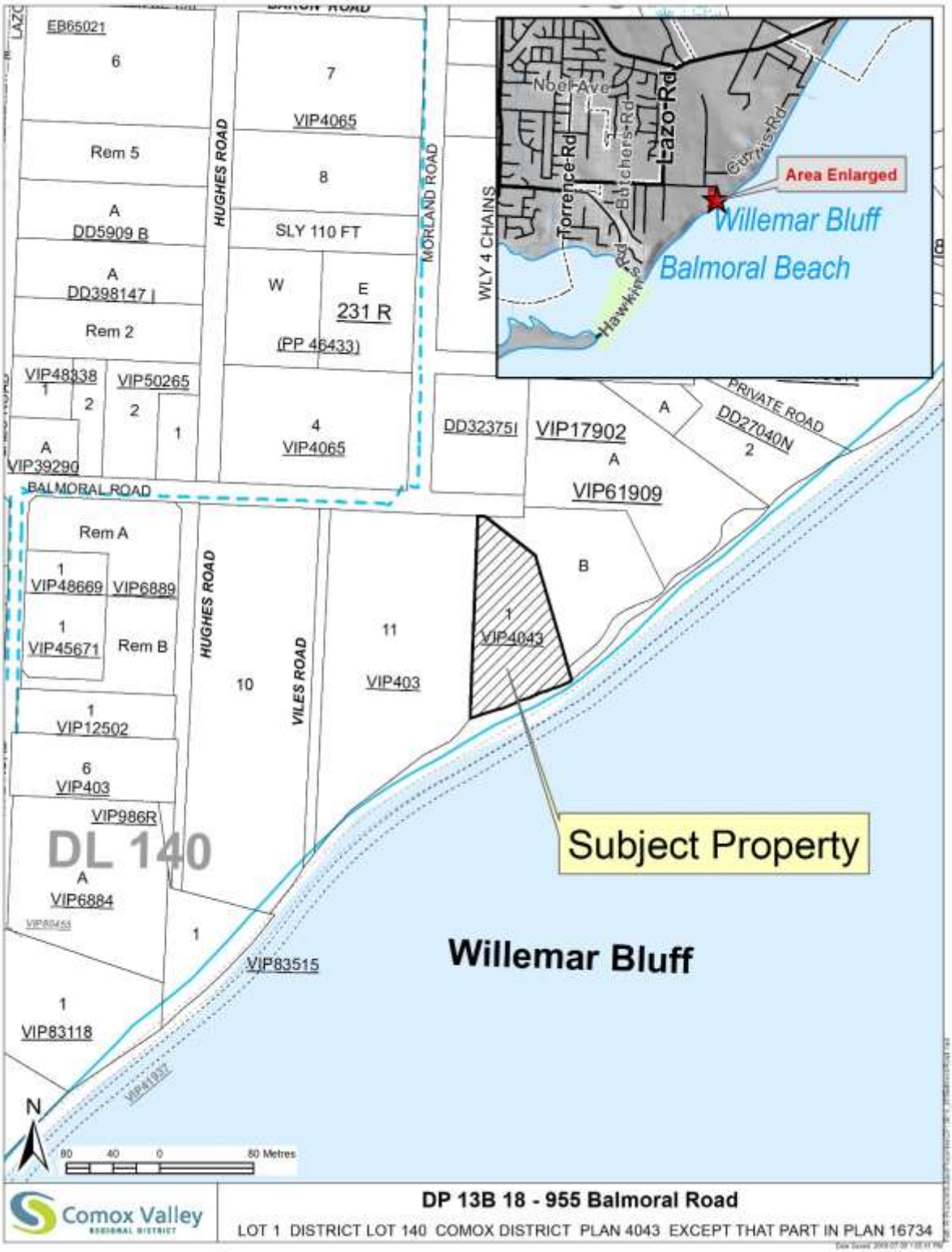
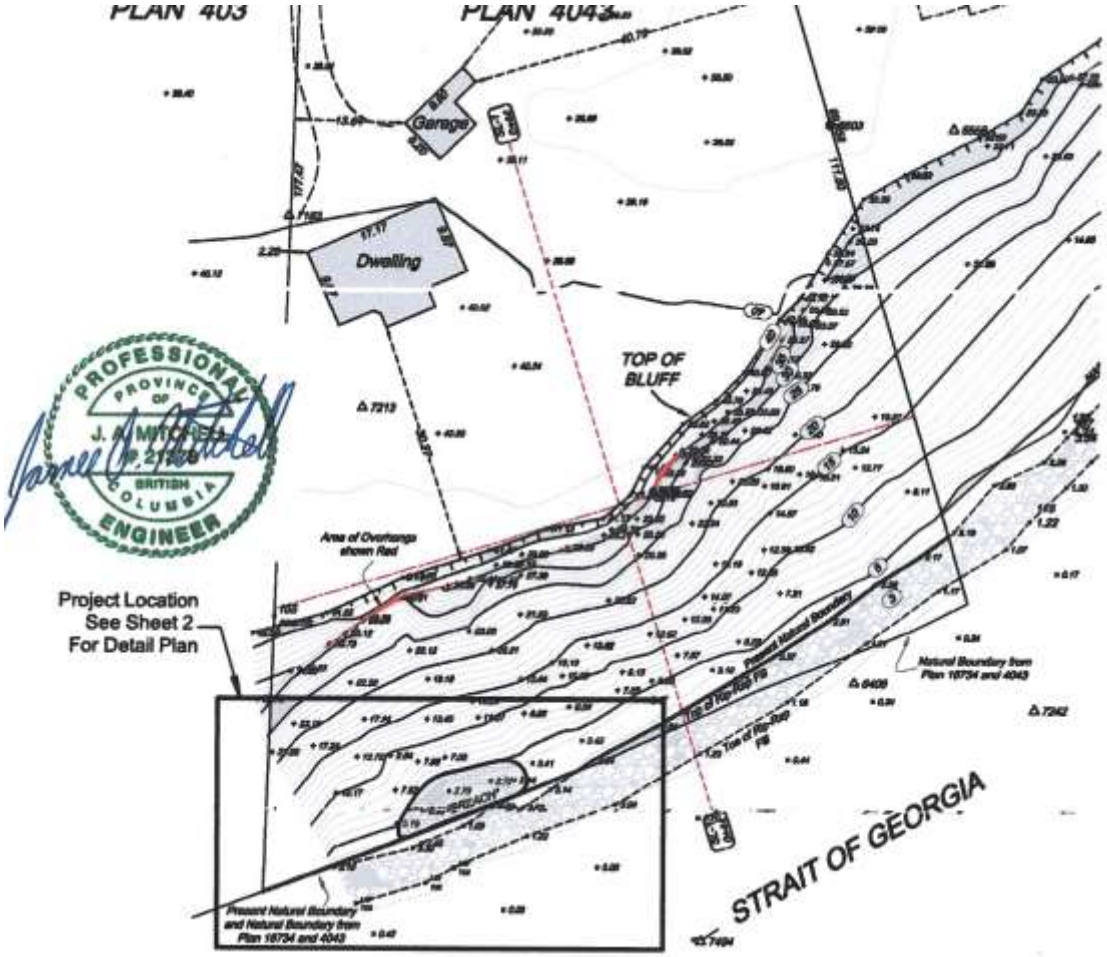
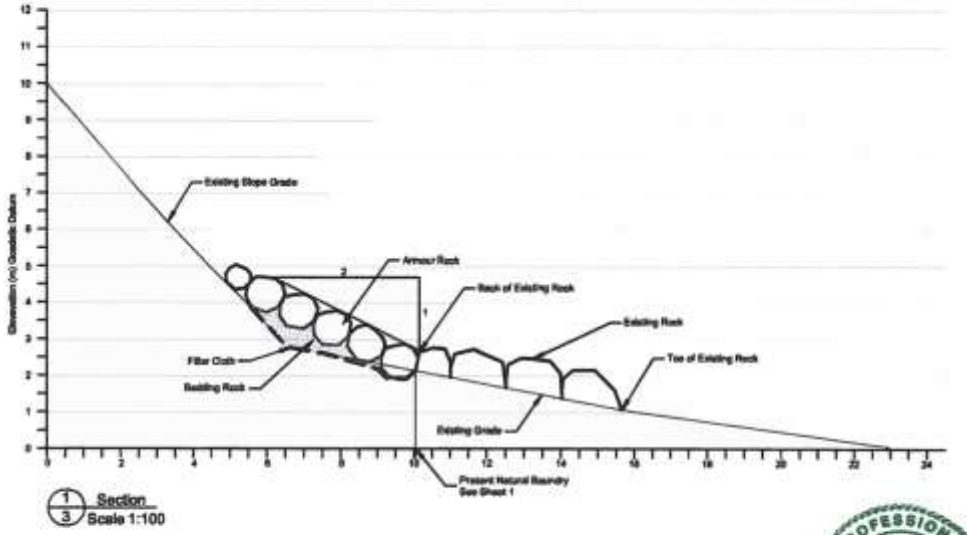


Figure 1: Subject Property Map

Figure 2: Aerial Photo



General Notes & Specifications:
- Remove Woody Debris
- Excavate Trench for Toe of Rock
- Place Filter Cloth Armtec 400 Non - Woven or Equal
- Place Bedding Rock 300mm Minus Angular Rock
- Place Armour Rock 1m ± 0.2m Measured by Average of 3 Perpendicular Directions, No Single Dimension Lese Then 0.6m
- Rock Shall Be Hard Dense Granitic or Basaltic Rock



1/3 Section
Scale 1:100

Figure 3: Proposed Works

Comox Valley
REGIONAL DISTRICT

Appendix A
Shoreline Protection Devices and Steep Slopes Development Permit

DP 13B 18

TO: Hilary and Bruce Renooy

1. This Development Permit (DP 13B 18) is issued subject to compliance with all of the bylaws of the Comox Valley Regional District applicable thereto, except as specifically varied or supplemented by this permit for the **purpose of repairing a shoreline protection device (rock revetment wall) within the titled boundary of the subject property.**

2. This Development Permit applies to, and only to, those lands within the Comox Valley Regional District described below:

Legal Description:	**Lot 1, District Lot 140, Comox District, Plan 4043 Except that Part in Plan 16734**		
Parcel Identifier (PID):	**006-149-341**	**Folio:**	**771 02291.000**
Civic Address:	**955 Balmoral Road**		

3. The land described herein (Schedule A) shall be developed strictly in accordance with the following terms and conditions and provisions of this permit:

   i. THAT this development permit is for shoreline protection repairs within the titled boundary of the subject property as shown on Schedule B. If the shoreline protection repairs extend onto Crown land, the applicants are required to obtain necessary Federal and/or Provincial approvals;

   ii. THAT shoreline protection repairs shall take place in accordance with the following professional reports:

      a. Coastal Engineering Report dated June 27, 2018, prepared by Jim Mitchell, P. Eng. of Emerald Sea Engineering, attached as Schedule C;

      b. Archaeological Assessment dated March 13, 2018, prepared by Owen Grant, BA of Baseline Archaeological Services Ltd, attached as Schedule D;

      c. Biophysical Assessment dated July 24, 2018, prepared by Rupert Wong, R.P. Bio and Danika Wong, Tech, attached as Schedule E;

      d. Geotechnical Report dated July 16, 2018, prepared by J. Fischer, P. Eng and Chris Hudec, P. Eng of Lewkowich Engineering Associated Ltd, attached as Schedule F;

   iii. THAT the applicant provide a Security Deposit in the form of an Irrevocable Letter of Credit or a Security Bond in the amount of $775.43 (125 per cent of $620.34) for implementation of the landscaping plan detailed in Schedule E;

iv. THAT the project engineer must notify the Comox Valley Regional District of the timing of the proposed works and the name of the selected contractor(s) who will do the works in compliance with the engineer's report;

v. THAT a copy of the forage fish survey completed by a Qualified Environmental Professional be submitted to the Comox Valley Regional District prior to the commencement of the shoreline protection repairs;

vi. THAT the fisheries window with the least risk is June 1 to September 1 and December 1 to February 15. If works are completed outside this window, it is the responsibility of the owners to ensure works do not contravene Section 35 of the *Fisheries Act* prohibition against serious harm to fish as per email correspondence from Current Environmental and Department of Fisheries and Oceans attached as Schedule G;

vii. AND THAT a post development report is required from the applicable Qualified Professional providing an assessment of all works. The report must assess if the works are in compliance with the applicable development permit conditions.

4. This Development Permit is issued following the receipt of an appropriate site declaration from the Property Owner.

5. This Development Permit (DP 13B 18) shall lapse if construction is not substantially commenced within two (2) years of the Comox Valley Regional District Board's resolution regarding issuance of the development permit (see below). Lapsed permits cannot be renewed; however, a new application for a second development permit can be applied for in order to complete the remainder of the work.

6. This Development Permit is ***not*** a Building Permit.

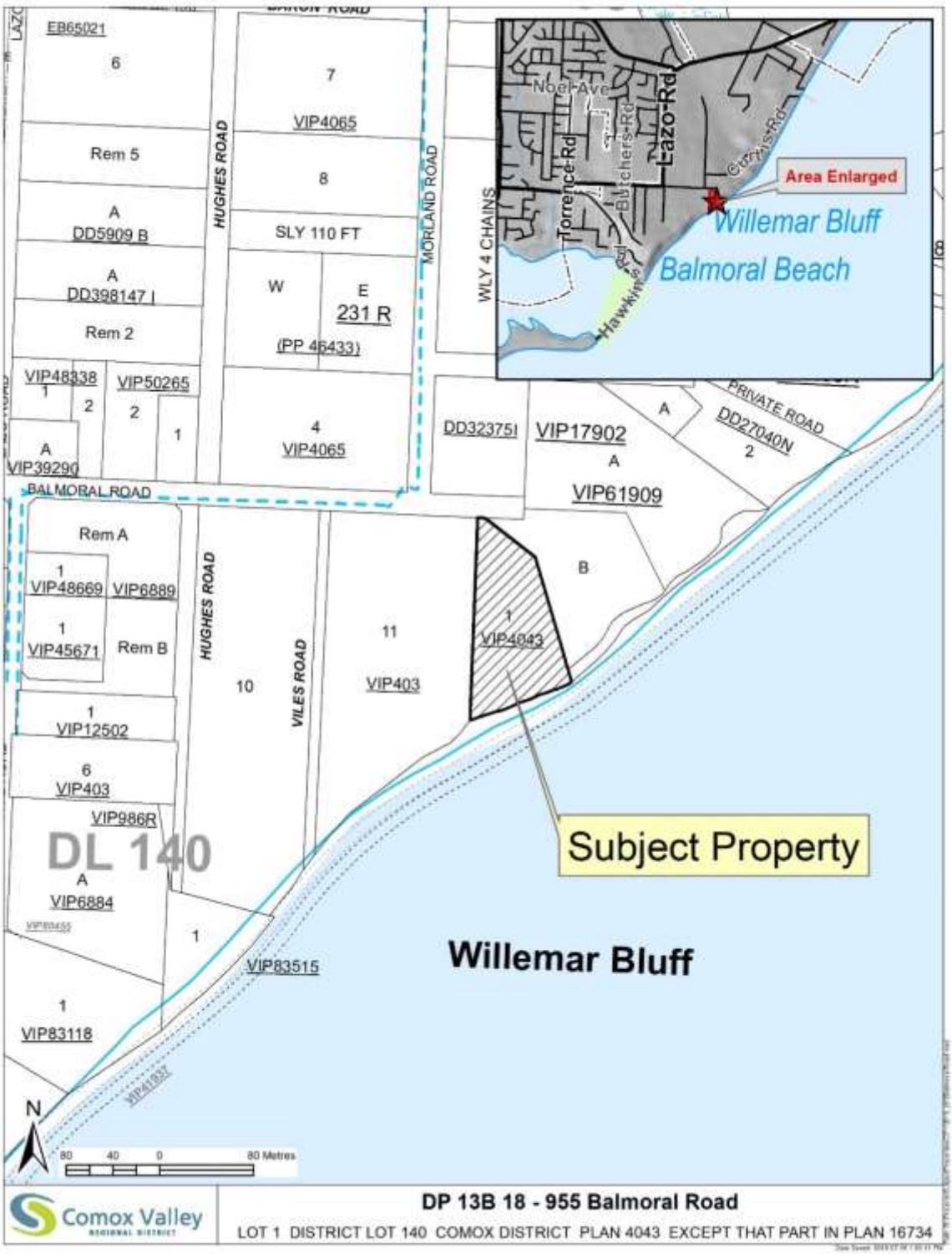
CERTIFIED as the **DEVELOPMENT PERMIT** issued by resolution of the board of the Comox Valley Regional District on _____.

_____
James Warren
Corporate Legislative Officer

Certified on _____

Attachments: Schedule A – "Subject Property Map"
Schedule B – "Site Survey"
Schedule C – "Coastal Engineering Report, dated June 27, 2018"
Schedule D – "Archaeological Assessment, dated March 13, 2018"
Schedule E – "Biophysical Assessment, dated July 24, 2018"
Schedule F – "Geotechnical Report, dated July 16, 2018"
Schedule G – "Email from Current Environmental and Department of Fisheries and Oceans, dated July 23, 2018"

Schedule A
Subject Property Map



TOPOGRAPHIC SITE PLAN ON LOT 1, DISTRICT LOT 140, COMOX DISTRICT, PLAN 4043, EXCEPT THAT PART IN PLAN 16734.

Parcel Identifier: 006-149-341

10 0 10 20 30 40 50 metres

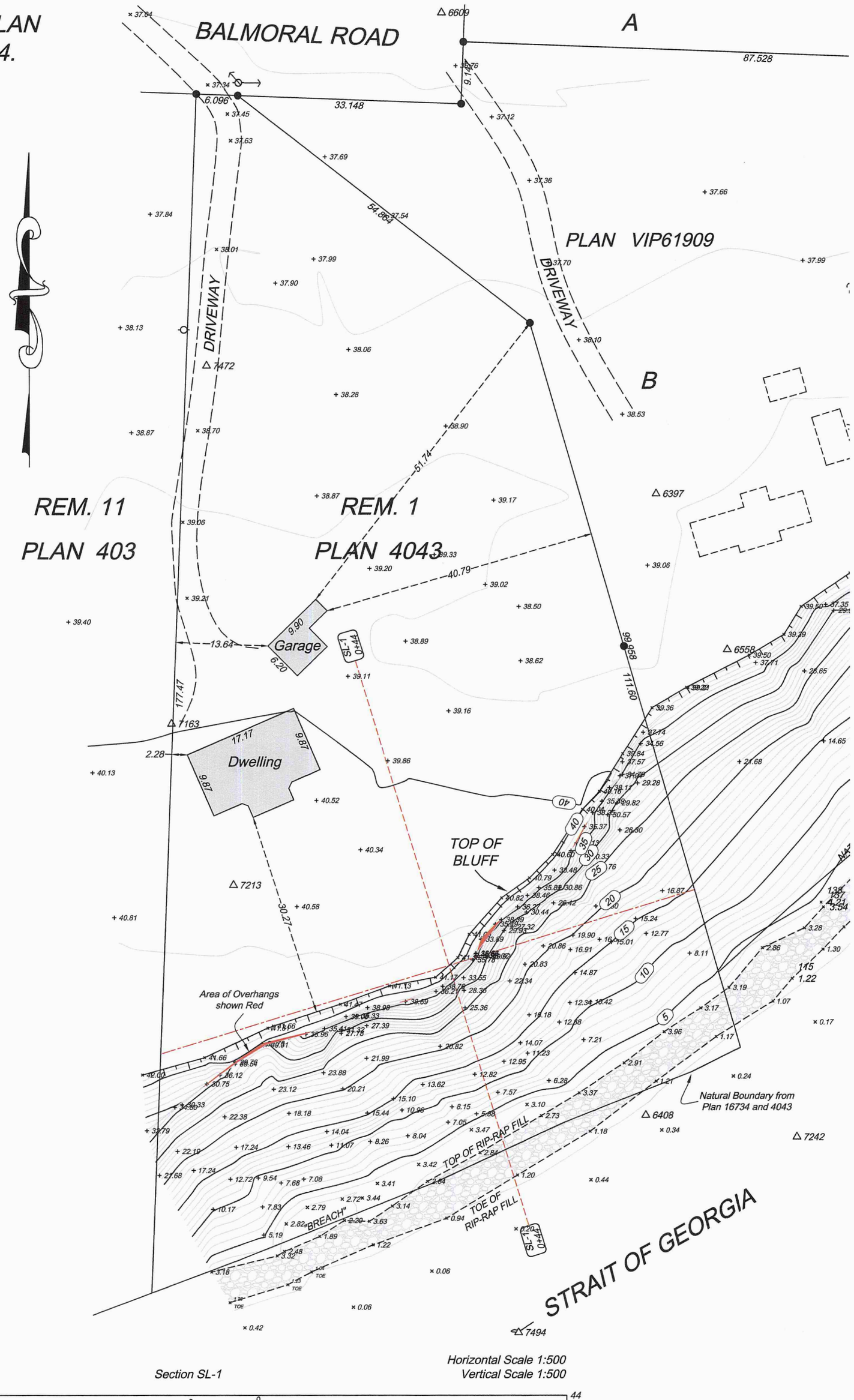
1:500

Legend

- top bank
- standard iron post found
- standard traverse hub placed
- hydro pole
- anchors
- +23.52 elevation point

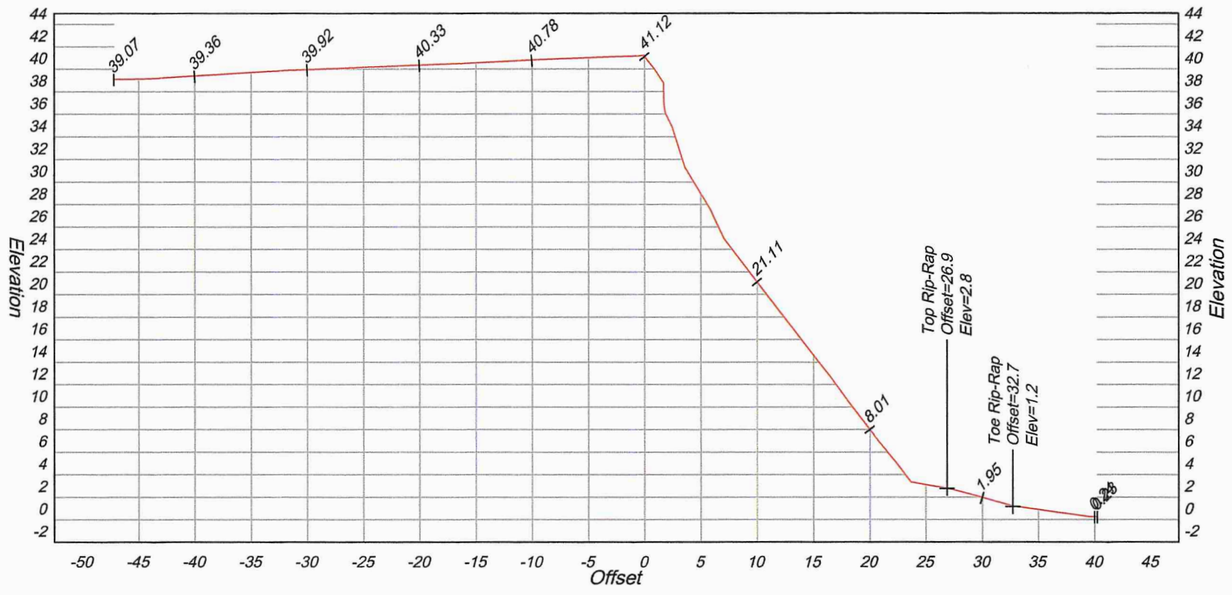
Bearings are NAD 83 grid bearings, derived from differential GPS observations and are referred to the central meridian of Zone 10 (123° West).

Elevations on this plan are referred to Geodetic datum CGG2013.



Section SL-1

Horizontal Scale 1:500
Vertical Scale 1:500



Date of Survey: Jan. 24/18

Civic Address
955 Balmoral Ave
Comox, BC

This document shows the registered dimensions of the above described property and the relative location of the surveyed structures and features with respect to the property boundaries. This document shall not be used to define property lines or property corners.

DN: c=CA, cn=Donald Grant 364AG6, o=BC Land Surveyor, ou=Verify ID at www.juricert.com/LKUP.cfm?id=364AG6
Date: 2018.01.31 16:01:13 -08'00'

_____, BCLS

This document is not valid unless originally signed and sealed.

GRANT LAND SURVEYING INC.
1-1841 COMOX AVENUE
COMOX, B.C. V9M 3M3
WWW.GRANTGEOMATICS.COM

FILE:

EMERALD SEA ENGINEERING

4920 Island Hwy North, Courtenay, BC V9N 5Z1
250-338-0882 jim.eseng@gmail.com

Green Shores *Green Sites* *Green Buildings*

June 27, 2018

To Bruce Renooy

Re: Coastal Engineering Design
Shore Protection
955 Balmoral Avenue, Comox BC

INTRODUCTION

As requested, Emerald Sea Engineering has provided the following report on the shore protection design for 955 Balmoral Avenue. This report can form the basis for the justification of why shore protection is required at this location and an opinion on the potential impacts to the shoreline adjacent to the project. The project has been initiated to repair a breach in an existing rock slope that occurred this last winter due to a tree sliding down the steep embankment. Once the tree was at the base of the slope, the wave action on the tree resulted in the movement and flattening of the slope. The elevation of the top of rock was lowered by as much as 1.5 m over a width of approximately 15m. This exposed the toe of the very steep sand bluff to wave action. The bluff is already overly steep and in fact is overhanging at the top and it is very susceptible to erosion should the toe of the slope become undercut.

METHODOLOGY

1. A limited field survey was completed of the beach slopes at the proposed construction site.
2. Extreme tidal water levels were estimated.
3. Offshore and near shore wave heights were estimated.
4. Stable rock size was estimated based on high water conditions combined with a design storm wave.

SHORELINE SURVEYS

On June 19, 2018, Emerald Sea Engineering completed a limited survey of beach slopes at the proposed site for the construction of the shore protection, surveyed tide water levels at a known time and verified some of the measurements for the area of existing rocks shown on the site topographic survey.

From nautical charts, the slope out to about 700 m offshore is less about 1%. This increases to about 2% within about 300m of the shoreline. Our survey showed that the slope from about 7 to 20 m seaward of the existing rock is about 0.5% and from the rock to a grade break in the gravel beach in front of the rock about 7 m away, the slope is about 14%.

Based on the survey of the water elevations in front of the project location, and estimated tide levels corrected for barometric pressure, we were able to verify that the geodetic elevations on the topographic survey correlated very well to chart or tidal datum (LNT). The estimated elevation of the seaward edge of the existing rock agreed within about 60 mm and the elevation of the back of the existing rock agreed within about 50 mm. This is excellent agreement as just the placement of the rod could account for this discrepancy. In conclusion, we confirmed that the topographic survey is a good basis for estimating extreme high water levels at the site based on corrected tidal datum.

We also measured between topographic points shown to be at the back of the existing rock and were able to determine that the existing rock as shown on the topographic survey is a good basis for showing the limits of shore protection on the shore protection design plans.

TIDAL WATER LEVELS

Tidal elevations (Chart Datum or LNT) were based on Point Atkinson data corrected to Comox and converted to Geodetic Datum (GSC) so as to be on the same basis as the topographic survey.

The primary datum of interest are the mean, large and extreme recorded high tide levels. Higher High Water Mean Tide (HHWMT), which is the average of the higher of the two high tides each day over a 19 year tidal epoch is 1.5 m GSC. The base

of the existing rock in front of the proposed shore protection ranges from about 1 to 2 m GSC in elevation. As a result, we would expect the average higher high tide each day to come up to about the middle of the existing rock. The Higher High Water Large Tide is the average of the highest tide each year over a 19 year tidal epoch. This elevation is 2.0 m GSC and is at the approximate elevation of the back of the rock and the start of the new shore protection. This means that on average, once a year we would expect the still water level to reach the base of the rock at the new shore protection. The extreme recorded water elevation is estimated to be 2.6 m GSC. This occurred once in about 100 years of data and the water depth at the new shore protection would be about 0.6m. In addition to these water levels, an allowance needs to be made for sea level rise. This is currently about 3 mm per year but is estimated to increase rapidly in the latter part of this century which will result in an estimated about 1 m of sea level rise by the year 2100. Sea level Rise is locally offset by geologic uplifting of Vancouver Island. This is also about 3mm per year. For a project with a lifetime of about 30 years, the sea level rise is estimated to be less than 0.2m. For a project with an expected life until 2100 it would be 0.7m. Wave runup and storm surge will also increase the water levels during significant storm events.

ESTIMATED WAVE HEIGHTS

The site has a very long fetch of about 36 km to the east of southeast, the direction of our most severe storms and there will be little reduction in wave height due to refraction and diffraction of waves at this site as it faces almost directly to this heading. Extreme offshore wave heights are estimated to be as much as 4.8 m in height with a duration of 7.6 seconds. However, these wave heights will be limited by water depth close to the project. It is estimated that the wave height in 1 m depth of water at the toe of the new rock will be 1.6 m.

STABLE ROCK SIZE

While having a significant storm with 1 to 2 m high waves at the shoreline and this high a water level is expected to be a very rare event with an expected occurrence of less than 1 in 100 years, it is considered an appropriate design wave height for rock stability. It is estimated that the stable armour rock size for this wave height is

0.8 m average diameter. This has been rounded up to 1.0 m average diameter +/- 0.2 m for use in the design to provide a safety factor for sea level rise and wave run up. This is for a 2:1 slope which is a moderate slope which is required to fit the rock in the narrow area of the new rock slope while putting the top of the rock at an elevation of about 5m GSC, above most wave runup (See attached Shore Protection Section).

EXPECTED IMPACTS ON ADJACENT SHORELINE

Due to boundary restrictions, a development permit can only be issued for the area located behind the line of the existing rock. Since the new rock slope is constructed at the back of the existing rock, any edge effects and scour at the base of the new rock are mitigated by the existing rock. In addition, the existing rock forms a relatively flat rock slope in front of the new project to dissipate wave energy. As a result, it is not expected that the project will have any impact on the adjacent rock slopes. The project is also not located right next to the boundary of the property so any edge effects that might occur would not be in the immediate proximity of the neighbouring lots.

PLANTING

It is not recommended that planting be attempted on the new rock slope. The existing rock on either side of the project is scoured clean from vegetation and it is expected that this would be the case with the new rock slope so it is unlikely that any plants could be established. Existing plants, trees and shrubs adjacent to the project are above and behind the existing rock. Above the new rock is a very steep sand bank that will not likely support any plants. As a result it is proposed to just let natural reseeding take place and it is possible that some grasses and shrubs may establish at the highest parts of the new rock slope that are less frequently impacted by waves.

CONCLUSION

The project is required to mitigate erosion risks to a localized area created by a tree fall in last winter's storms. The bluff in this area is at high risk of erosion being very steep, having a slight overhang at the top and having little vegetative cover. We conclude that the installation of large rock of approximately 1 metre diameter is required in this severe environment which is frequently inundated with waves of over a metre in height.

CLOSURE

This report has been prepared for the exclusive use of Bruce Renooy and his appointed agents. Any use or reliance made on this report by an unauthorized third party is the responsibility of that third party. This report may also be relied upon by the Comox Valley Regional District in considering of a Development Permit application.

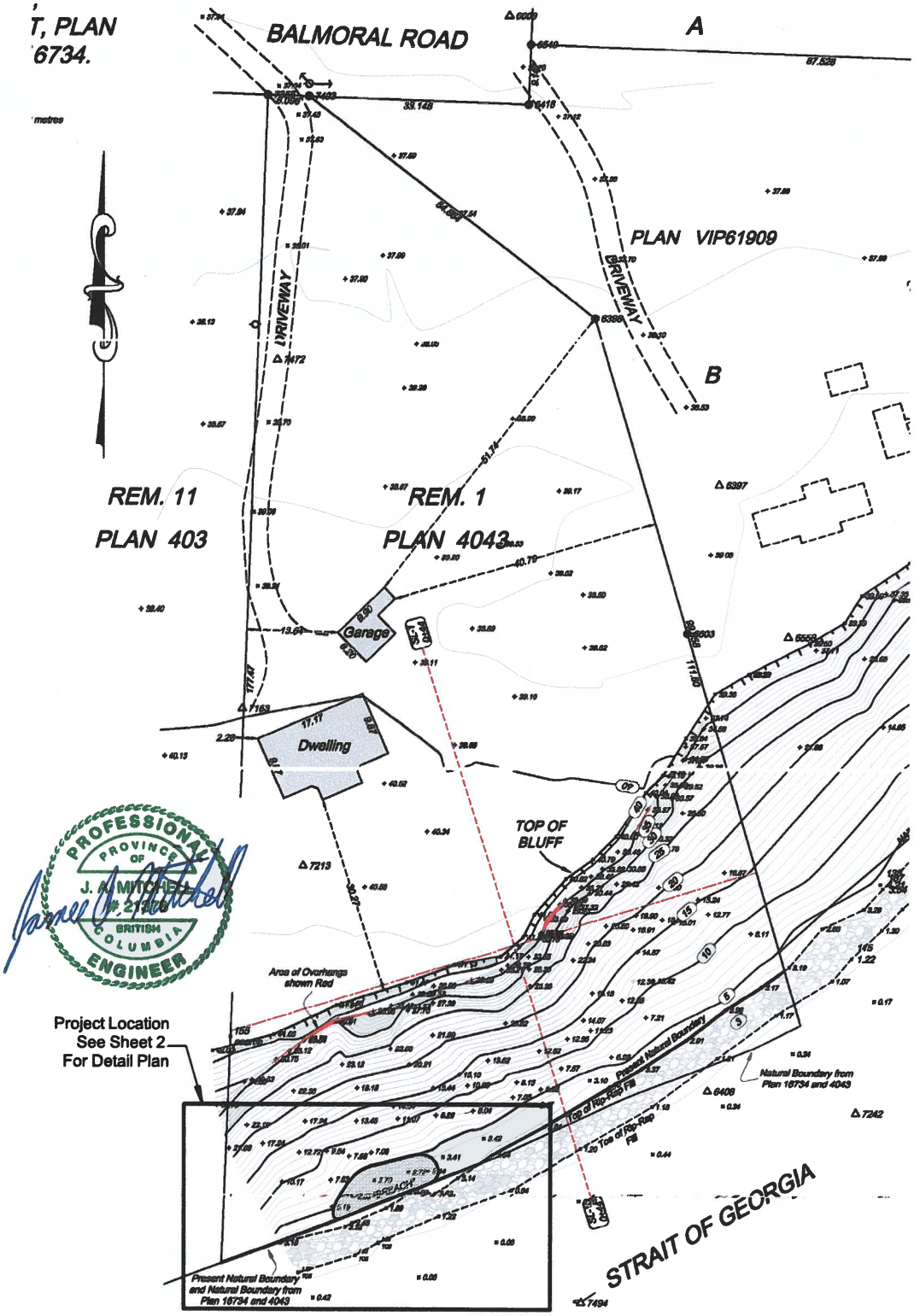
This report was prepared by Jim Mitchell, a Professional Engineer in good standing with the Association of Engineers and Geoscientists of British Columbia and has adequate experience to provide this report.

We trust that this report meets your needs. Please contact us at if you require additional information or clarifications.

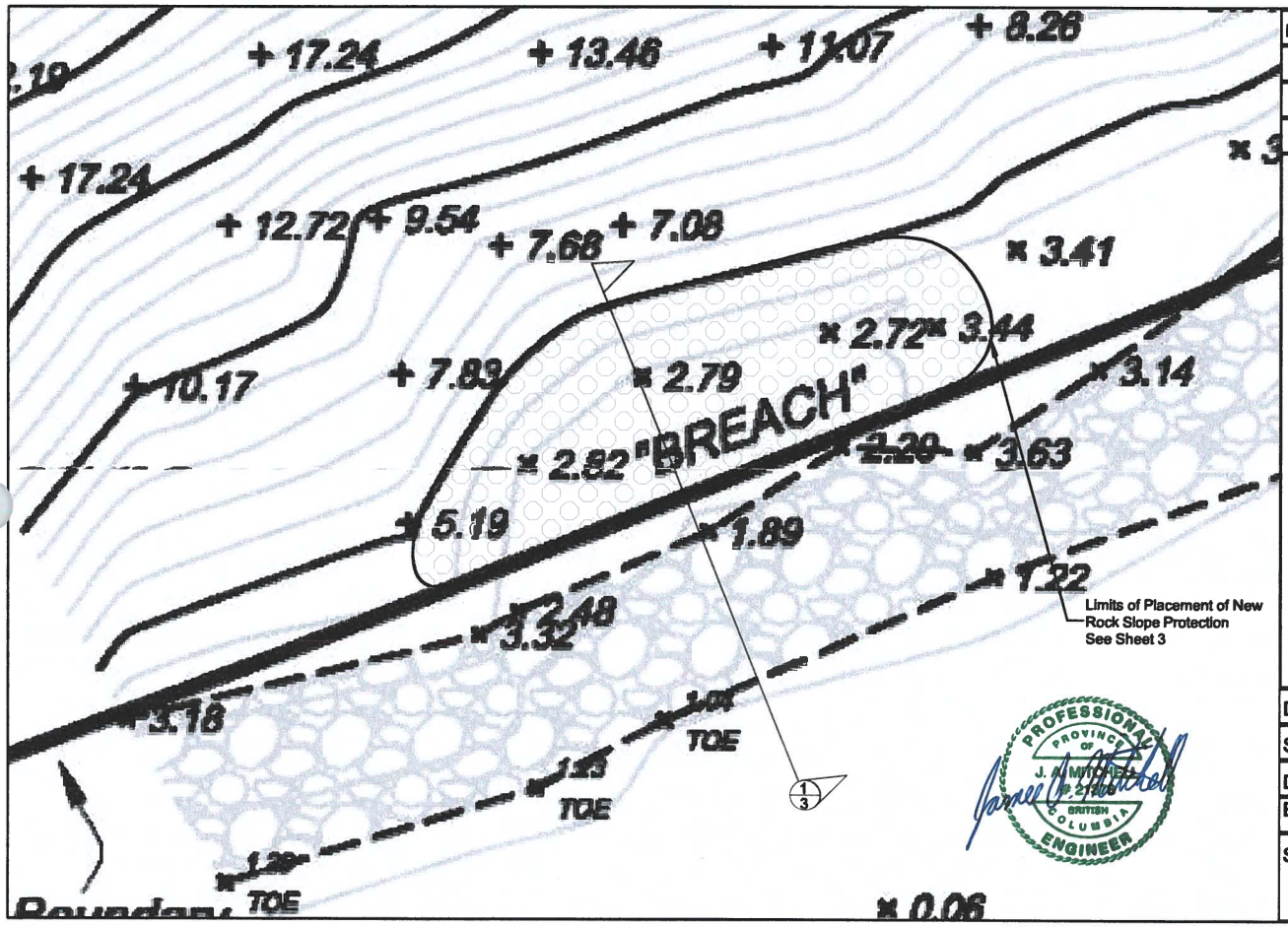
I certify this to be a report prepared by

Jim Mitchell, MSc, PEng
Emerald Sea Engineering

Attachments: Shore Protection Plans and Sections - 3 - 11"x17" Drawings



Sheet 1 of 3 Sheets	Balmoral 955	Drawn: DBB	Scale: 1:600	DATE: 22 June 18	Emerald Sea Engineering 4920 Island Highway North Courtenay, BC V9N 5Z1 250-338-0882 jim.eseng@gmail.com	Balmoral 955 Site Plan with Project Location	REVISIONS BY



REVISIONS BY	

Emerald Sea Engineering
4920 Island Highway North
Courtenay, BC V9N 5Z1
250-338-0882
jim.cesng@gmail.com

Balmoral 955

Shore Protection
Detail Plan

DATE: 22 June 18

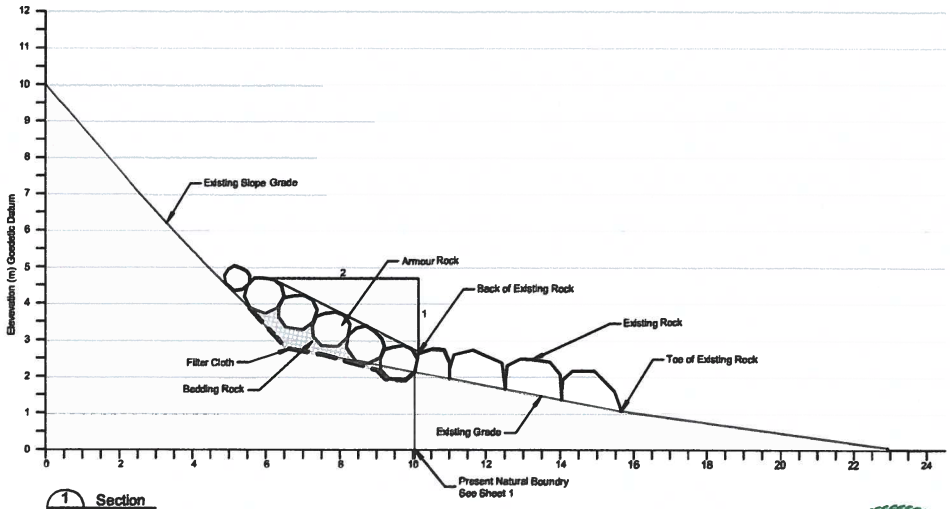
Scale: 1:100

Drawn: DBB

Balmoral 955

Sheet 2 of 3 Sheets

General Notes & Specifications:
- Remove Woody Debris
- Excavate Trench for Toe of Rock
- Place Filter Cloth Armtec 400 Non - Woven or Equal
- Place Bedding Rock 300mm Minus Angular Rock
- Place Armour Rock 1m ± 0.2m Measured by Average of 3 Perpendicular Directions, No Single Dimension Less Then 0.6m
- Rock Shall Be Hard Dense Granitic or Basaltic Rock



1/3 Section
Scale 1:100

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. A. MITCHELL
P. Eng.

REVISIONS BY	

Emerald Sea Engineering
4920 Island Highway North
Courtenay, BC V9N 5Z1
250-338-0882
jim.esenp@gmail.com

Balmoral 955

Shore Protection Section

DATE: 22 June 18

Scale: 1:100

Drawn: DBB

Balmoral 955

Sheet 3 of 3 Sheets

Baseline archaeological services ltd.
556 Harmston Avenue Courtenay B.C. V9N 2X5 Phone: (250) 897-3853

Archaeological Field Review of 955 (972) Balmoral Rd Comox

Client: **Contact:**	**Bruce and Hilary Renooy** 972 Balmoral Rd Comox BC V9M 3W2 Phone: (250) 650-9540 Bruce Renooy, Owner Email: renooy@shaw.ca
Development:	Minor Construction/Landscaping/Erosion Control
Development Type:	Shed Construction/Invasive Plant & Stump Removal/Planting Trees, Shrubs and bank stabilization
Legal Description	PID 006149341 Lot 1 Plan VIP4043 District Lot 140 Land District 15 Except Plan 16734
First Nation:	**K'ómoks First Nation** 3330 Comox Rd. Comox, B.C. V9N 3P8 Email: info@komoks.ca
Distributed To:	Bruce Renooy
Project #:	18001
Heritage Permit #:	N/A
Report Author:	Owen Grant, BA
Report Date:	March 13th, 2018
Municipality/ Regional District:	Town of Comox/ Comox Valley Region District
Location:	The subject property is located at 955 (972) Balmoral Road in Comox on Vancouver Island
Coordinates:	Latitude 49° 40' 23.5" Longitude 123° 53' 29.82"
Elevation:	Approximately 0-50 m above sea level
Survey Date:	March 9th, 2018
Survey Crew:	Owen Grant (Baseline) and Bruce Renooy
NTS Mapsheet: **Other Maps:**	92F/10 Comox Overview, Midrange (1:50000, 1:5000)
Archaeological Concerns:	**None**

Background Information

Bruce Renooy contacted Baseline Archaeological Services Ltd. (Baseline) and requested an archaeological overview assessment (AOA) and preliminary field reconnaissance (PFR) at 955 Balmoral Rd in Comox. The PFR was requested in order to determine the need for further archaeological work in advance of a proposed upgrades to the property including land clearing, erosion control/bank stabilization as well as future upgrades to the home and out buildings.

Prior to the PFR, a background file search using the Remote Access to Archaeological Data (RAAD) application indicated that there were no previously recorded archaeological sites in conflict with, or located in proximity to the study area, (*Figure 1*) however archaeological potential modeling for the area indicates there is both moderate and high potential for archaeological sites to exist on the property. The nearest previously recorded archaeological site (DkSf-65) is situated approximately one kilometer to the north.

According to provincial guidelines when a property has a direct overlap with an area of significant archaeological potential the land owner is directed to hire a qualified consulting archaeologist to determine if an archaeological impact assessment (AIA) is warranted.

Methodology

The archaeological survey consisted of multiple pedestrian traverses through the property. Natural land and water features as well as property lines guided traverses. Ortho maps and information provided by the client was used to identify areas of archaeological potential in the field. Surface and subsurface exposures, such as sparsely vegetated areas, tree bases, trails, root wads and cut banks were inspected for archaeological material or modifications.

Photo 1: View southwest from edge of property.

Description

The study area (2.43 acres) is a private lot situated on the east coast of Vancouver Island, within the community of Comox near the terminus of Balmoral Road. The study area's vegetation consists of alder, fir, cedar and fruit trees with shrubs and ground cover including, salal, sword fern and Oregon Grape as well invasive species such as scotch broom and blackberry. The lot is generally flat to undulating separated from the beach by a steep eroding escarpment. The southern extent of the property was historically cleared and has a home built in the 1980s while the remainder of the property is treed and undeveloped. Historically, the property has been reduced in length by several meters due to ongoing erosion along the southern boundary.

Field Potential and Coverage

The in-field potential assessment for archaeological sites was low. This is primarily due to the following variables:

- the lot being separated from the beach by a steep embankment
- the absence of potable water in the area
- the significant loss of land through erosion
- historic landscaping and construction

The survey coverage consisted of a visual surface examination of the southern portion of the lot including the base of the cliff at sea level where ground altering activities will take place.

Based on the survey coverage and the in-field assessment, the potential for unrecorded archaeological resources within the lot is low.

Results

No archaeological remains or areas with potential for subsurface archaeological deposits were identified within the subject property as delineated on Figure 2.

Potential Impacts

No known archaeological resources will be impacted from the proposed ground altering activities on the subject property.

Recommendations

No further archaeological work is recommended for subject property.

Although the ground disturbing activities are expected to be minimally invasive with a relatively small footprint there is always the potential for unexpected isolated artifacts even in areas of low archaeological potential therefore developers and operators should be aware of the potential of undiscovered archaeological remains in any surveyed or unsurveyed areas which are protected under the *Heritage Conservation Act (HCA)*. The HCA requires all development activities in the vicinity of archaeological remains to be halted as not to threaten these remains, and to immediately notify the BC Archaeology Branch.

Photo 2: View north from edge of lot.

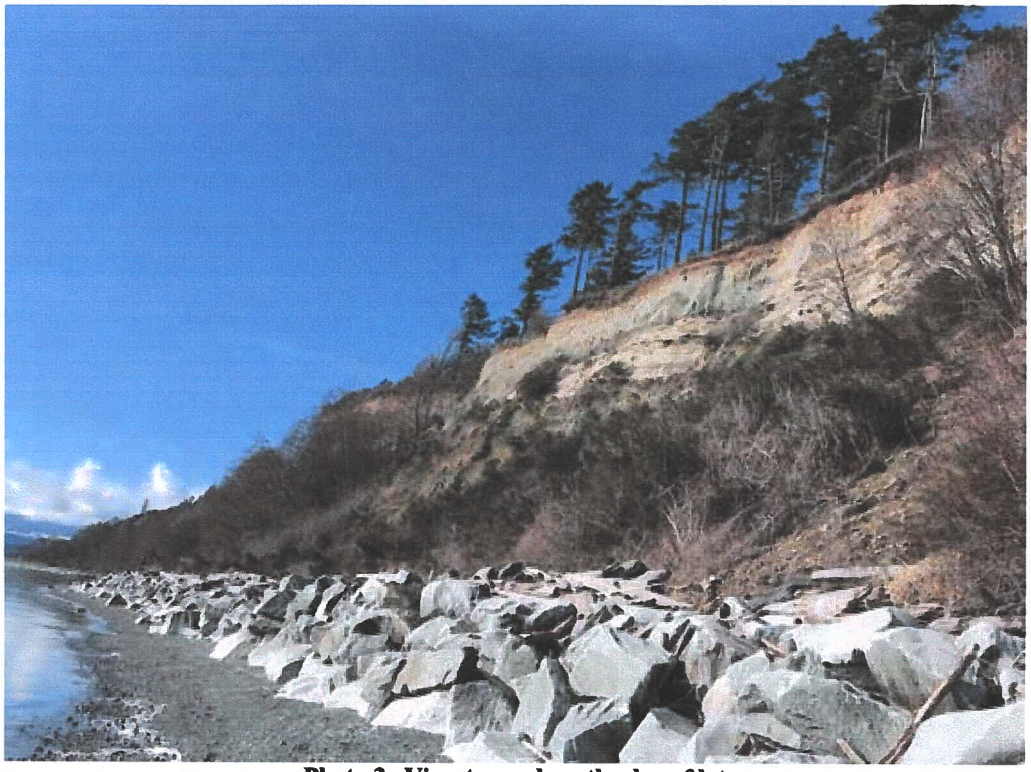


Photo 3. View toward south edge of lot

Photo 4. View of lot's current vegetation

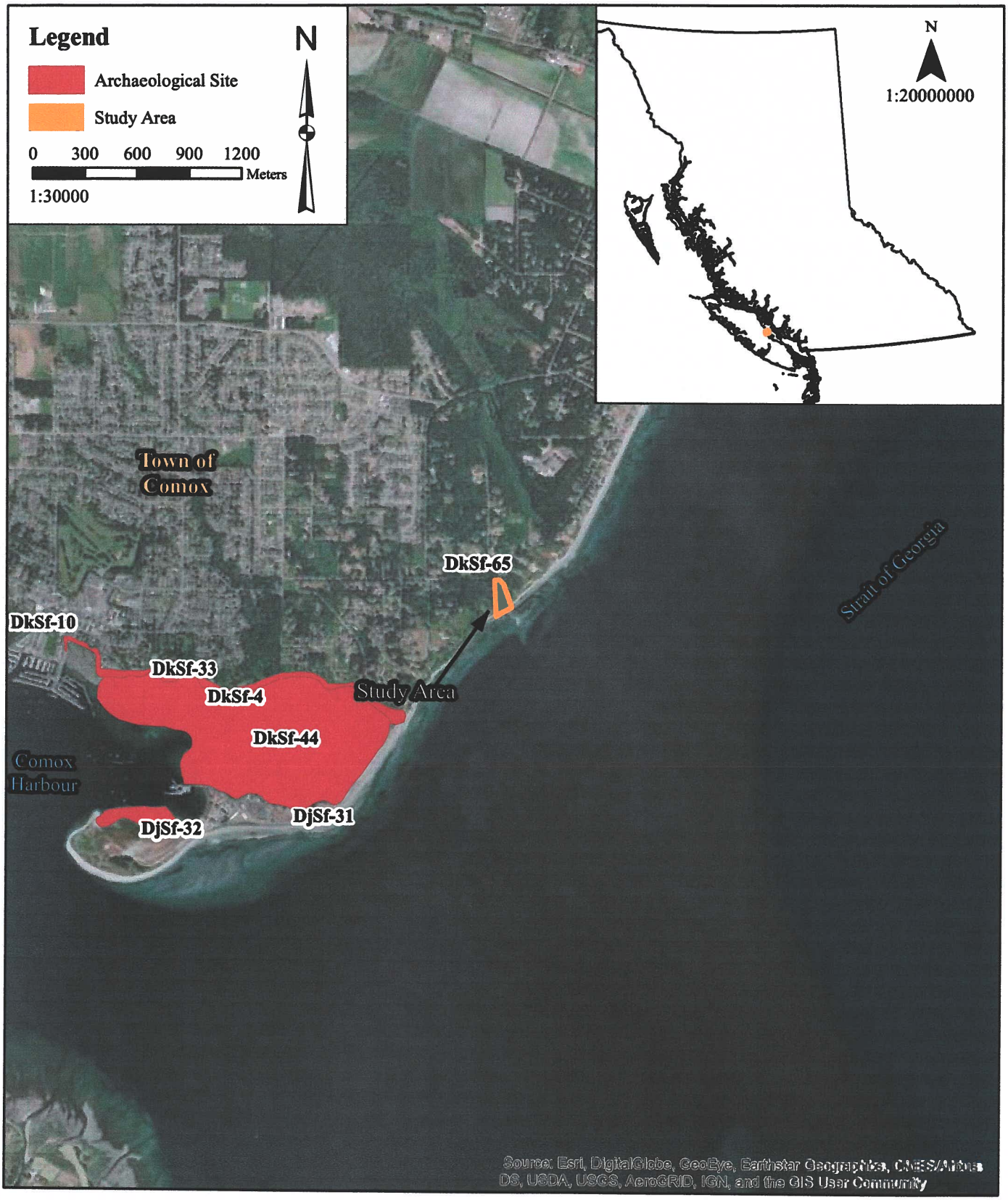


Figure 1. Location of Study Area

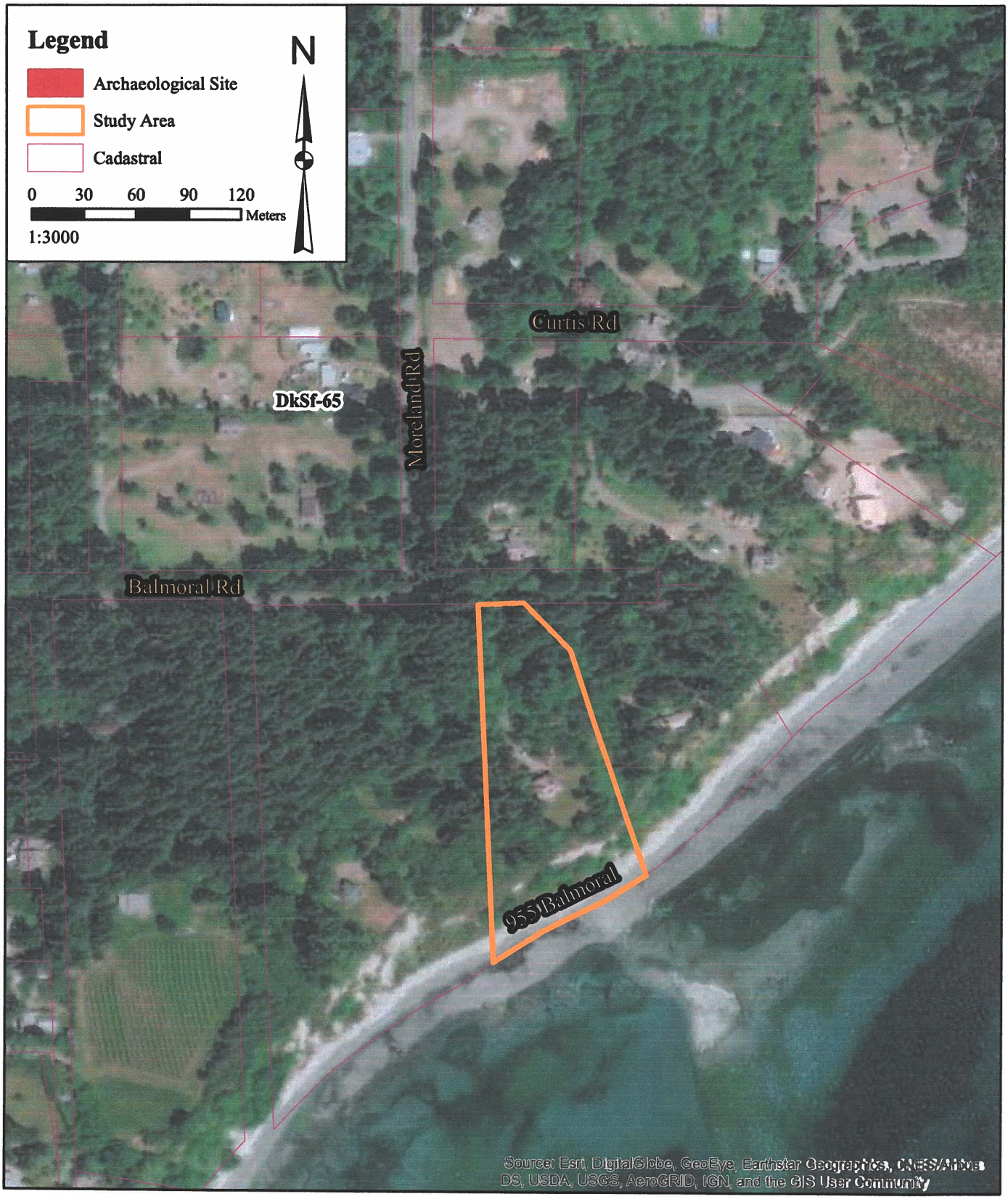


Figure 2. Archaeological Site Map

current ENVIRONMENTAL
558 England Ave
Courtenay, BC V9N 2N3
p: 250.871.1944
w: currentenvironmental.ca

To:	Bruce & Hilary Renooy, Proponents	Date:	Updated 24 July, 2018
From:	Rupert Wong, RPBio	Pages:	23
	Danika Wong, Tech		
Cc:	CVRD Planning Department	Project:	955 Balmoral Road

Subject(s): Biophysical assessment for shoreline protection repair

This letter report describes the existing biophysical state for the site of a proposed rip rap repair based on a reconnaissance level survey of the subject property and adjacent shoreline at 955 Balmoral Road (previously 972 Balmoral Road) in Comox, BC.

TABLE OF CONTENTS

1 INTRODUCTION

This letter report is intended to inform the Comox Valley Regional District (CVRD) of the current biophysical state of the shoreline protection devices development permit area (SPDDPA) at the Willemar Bluffs pursuant to CVRD Bylaw 337 Section 83[1] as it affects the subject property. This report precludes the requirement for an application for the aquatic and riparian habitat development permit area (ARHDPA), per Section 80 of the same bylaw. This report satisfies the CVRD's requirements for a biophysical assessment prepared by a Registered Professional Biologist for an SPDDPA.

Specific objectives of this report include the following:

1. Identify potential effects of the proposed rip rap repairs on the shoreline habitat;
2. Identify site potential for rare occurrences of wildlife, plants, and plant communities in and around the subject site that may be impacted by proposed work;
3. Discuss opportunities for sensitive habitat protection and/or enhancement as needed.

2 BACKGROUND

The subject property is a 0.98 hectare lot located at 955 Balmoral Road (previously 972 Balmoral Road) in Comox, BC (Figure 1). The property currently has the legal description of Lot 1, DL 140, Plan VIP4043. The property is zoned for Rural Eight land use. The land use of surrounding properties to the north, east, and west is of the same zoning, and appears to be primarily residential use. The Strait of Georgia borders the property to the south.

2.1 PROPOSED WORKS

The existing rip rap is located partially within and partially outside of the property boundaries for the subject property and was originally installed in 1993. There is a breach in the existing rip rap structure, and the proponent wishes to repair the damage. The breach is located on a portion of the rip rap which is partially outside of the property boundary on Crown land (Photo 1), but repairs are entirely within property boundary landward of the existing rip rap toe (Appendix A). The area of proposed work is outside of the area below high water mark that requires a DFO Request for Review (RFR). There is no requirement for an RFR for machine access to the site.

To repair the breach, a small trench will be excavated, lined with non-woven geotextile, and filled with bedding rock (300 mm minus) and rip rap (approx. 1 m). Rip rap will be installed at a 2:1 slope. See Sheet 3 of designs in Appendix A for specifications.

1 CVRD (2014). Bylaw No. 337. Rural Comox Valley Official Community Plan. Shoreline protection devices development permit area. Schedule "A". pp.64

Figure 1. Subject property location at 955 Balmoral Road (previously 972 Balmoral Road) in Comox, BC (red outline). Adapted from CVRD iMap.

3 METHODS

3.1 BACKGROUND REVIEW

Information on known environmentally sensitive features within the subject property was obtained from government and online databases including the following:

1. Comox Valley Regional District (CVRD) iMap[2];
2. Sensitive Habitat Inventory Mapping (SHIM)[3];
3. Wildlife Tree Stewardship Atlas (WiTS)[4];
4. CDC At-Risk "Known Occurrences" Atlas – BC Ecosystem Explorer[5];
5. Great Blue Heron (GBHE) Management Team Atlas[6].

3.2 FIELD ASSESSMENT

Field assessment of the property was completed on 9 March, 2018 to assess environmentally sensitive features on the property. The following sections provide additional detail on specific inventory methods.

[2] Comox Valley Regional District (2017). CVRD iMap 2.2. Accessed from <http://imap2.comoxvalleyrd.ca/imapviewer/>

[3] Sensitive Habitat Inventory Mapping (SHIM) Atlas (2017). The Community Mapping Network. Accessed from <http://www.cmnmaps.ca/SHIM/>

[4] Wildlife Tree Stewardship (WiTS) Program (2017). Nest Tree Report. The Community Mapping Network. Accessed from <http://www.cmnmaps.ca/wits/>

[5] B.C. Conservation Data Centre: CDC iMap. 2017. Ministry of Environment, Victoria, B.C. Accessed from <http://maps.gov.bc.ca/ess/sv/cdc/>

[6] Great Blue Heron (GBHE) Management Team (2017). The Community Mapping Network. Accessed from <http://cmnmaps.ca/GBHE/>

3.2.1 Aquatic Habitats and Species

The site visit was timed to coincide with low tide. No sampling for fish or egg presence was performed for the assessment. Survey methods were informed in part by *Develop with Care – Environmental Guidelines for Urban and Rural Land Development in British Columbia*[7].

3.2.2 Terrestrial Habitats and Species

Survey methods for terrestrial elements or Valued Ecosystem Components (VECs) were directed in part by those outlined in *Environmental Best Management Practices for Urban and Rural Land Development in British Columbia*[8], and the *Field Manual for Describing Terrestrial Ecosystems*[9].

3.2.3 Species at Risk and Raptor Nesting

An office-based inquiry of Species at Risk occurrences on and near the property was completed using the *CDC BC Species and Ecosystems Explorer.* Raptor and heron nesting sites were researched using the online *WiTS Atlas* and the *GBHE Atlas*. The onsite assessment was completed during the site visit following the guidelines outlined in *Environmental Best Management Practices for Urban and Rural Land Development.*

4 RESULTS

According to the background search, there are no known at-risk species or terrestrial ecosystems on or near (within approximately 500 m) the subject property. Sensitive features are therefore limited to the steep bluffs and the marine shoreline.

4.1 SPECIES AT RISK AND RAPTOR NESTING

According to background searches using the CDC, WiTS and GBHE atlases, no known raptor nests or heron breeding sites occur within a concerning proximity to the subject property. The absence of active nesting sites and species at risk immediately affecting the property was confirmed during the 9 March site visit. The trees on and adjacent to the subject property see frequent use from bald eagles. The location and elevation of the property adjacent to the shoreline makes it highly attractive to bald eagles. No nests were observed, and the area appears to be used by a number of eagles for feeding and perching; it is not limited to a breeding pair (Photo 2). At any point during development, a QEP should be consulted if nesting or species at risk activity is observed.

4.2 MARINE SHORELINE

Substrates were assessed from the high water mark (HWM) to the water's edge at the time of the assessment. The substrates were characterized by two distinct sizes measured from the toe of existing rip rap to the water's edge (Photo 3, Photo 4, and Photo 5). The first 6 m adjacent to the toe of the rip rap comprised of sandy pea gravel with

[7] < Ministry of Environment (2014). Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia. Accessed from < http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/>

[8] Ministry of Environment (2004). Environmental Best Management Practices for Urban and Rural Land Development in British Columbia. Accessed from < http://www.env.gov.bc.ca/wld/documents/bmp/urban_ebmp/urban_ebmp.html>

[9] Ministry of Forests, Lands and Natural Resource Operations (formerly Ministry of Forests and Range) and Ministry of Environment (2010). Field Manual for Describing Terrestrial Ecosystems, 2nd Edition. Accessed from <http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/conservation-data-centre/field_manual_describing_terrestrial_ecosystems_2nd.pdf >

some gravel and cobble scattered throughout. From 6 m to the water's edge (approximately 31 m from toe of rip rap), the substrates were predominantly large cobbles with occasional boulders. In this larger particle substrate, there were small pools scattered along the shoreline. Intertidal vegetation (mostly Fucus sp.) and barnacles were also common in the area beyond 6 m from rip rap. These substrates are not suitable for forage fish spawning by species such as Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*), but the 0 – 6 m substrates could potentially be used for spawning. Pacific herring (*Clupea pallasii*) spawn primarily on subtidal vegetation. Based on a cumulative spawning map of spawning records up to 2015, the subject property is adjacent to an area that has had spawning magnitude surveyed (Figure 2). The subject property is adjacent to an area where herring spawn is ranked in the 95 – 100% range of herring spawn areas and is given a herring spawn classification of "vital". The site assessment coincidentally took place the day after herring spawn, and the water was extremely active with feeding wildlife (Photo 6).

The shoreline cannot be accessed using the subject property. Machine access will be from the Curtis Road beach access on Cardem Road (Figure 3). Along this approximately 1 km route, there is suitable material (sand and gravels) for forage fish spawning. The entire access route will be included in the scope of the best management practices required in this report, and will be assessed for spawning prior to machine access.

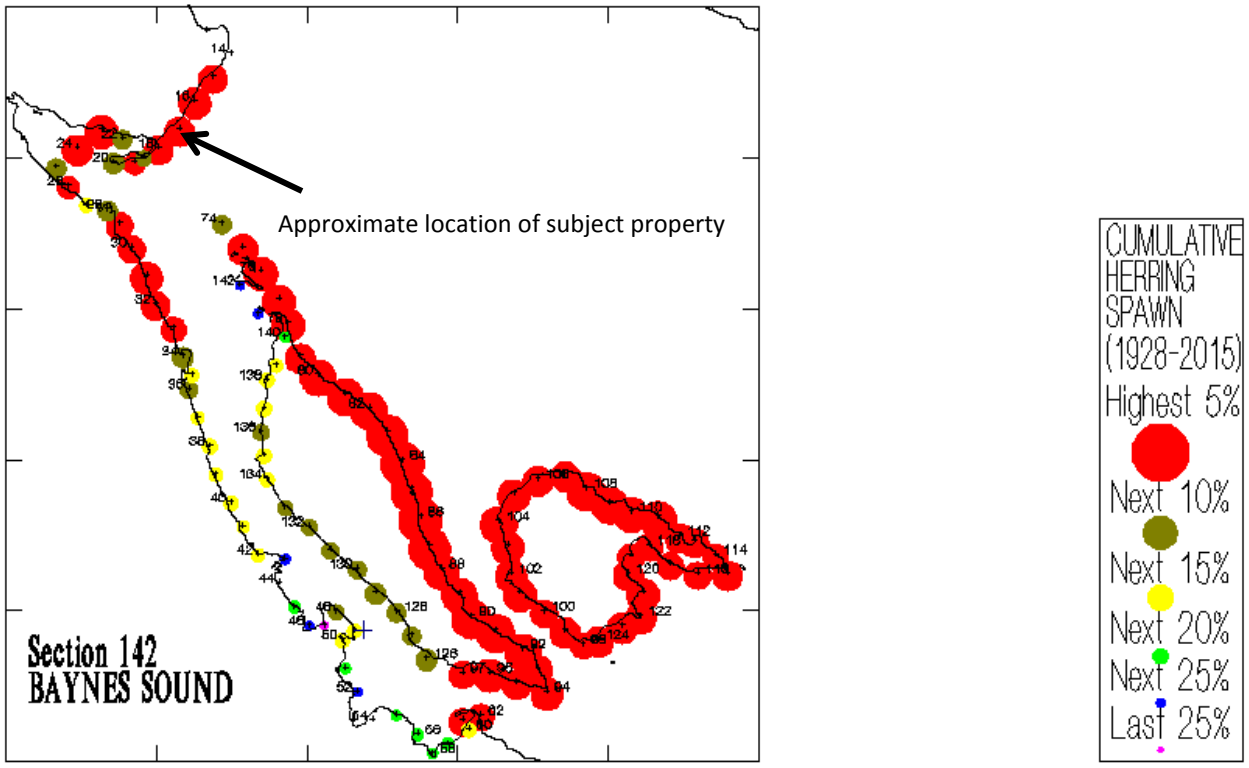


Figure 2. Cumulative Pacific herring spawning map (1928-2015) in Section 142 Baynes Sound showing the subject property is adjacent to a red dot (vital herring spawn classification). Source: DFO.

At the subject property, there is existing rip rap that acts to prevent erosion of the bluffs. The rip rap is contiguous with rip rap protection of the neighbouring properties to the northeast and southwest. The entire rip rap structure along the shoreline was installed in 1993.

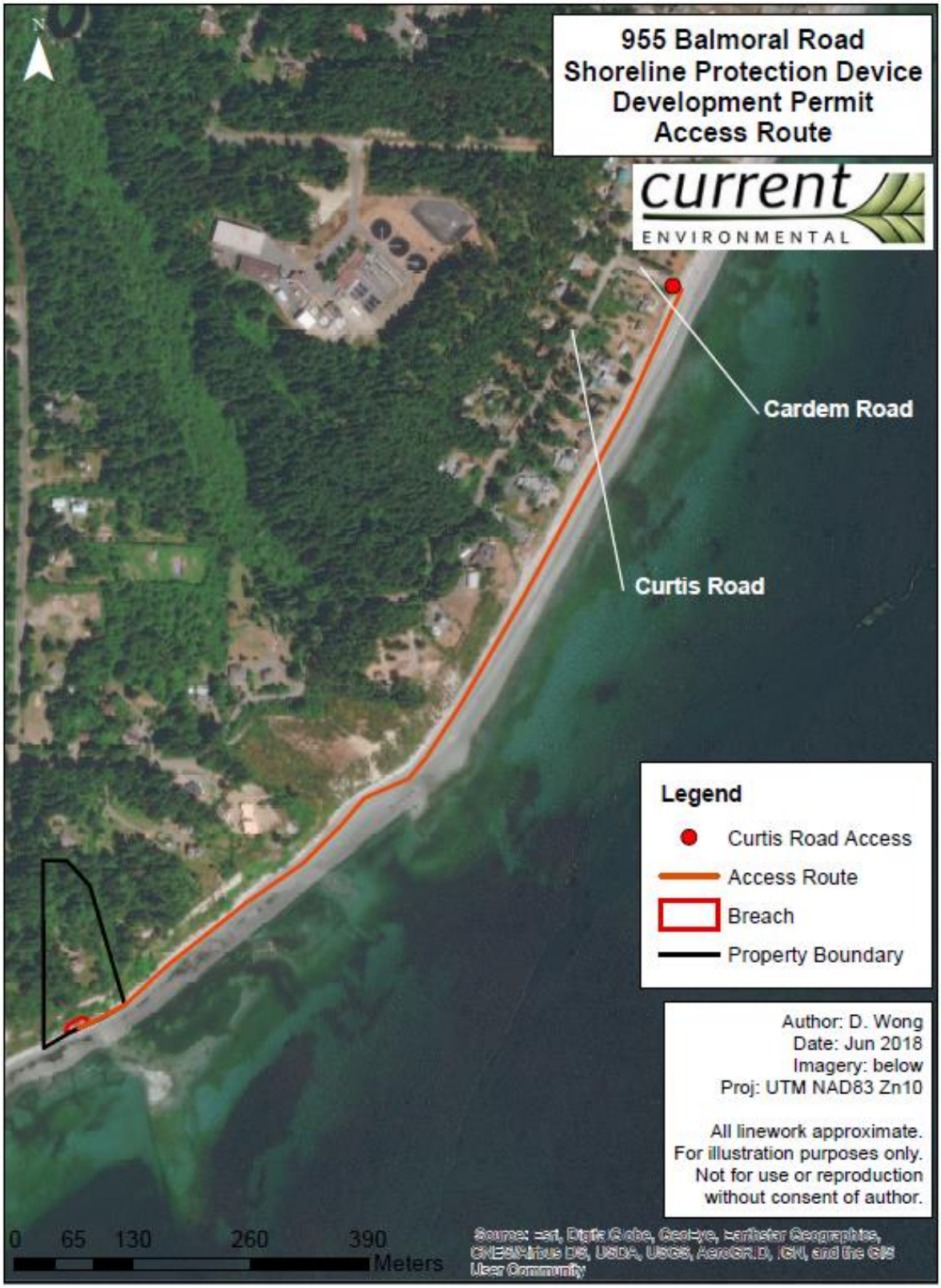


Figure 3. Map of the access route for machinery to work on the shoreline at 955 Balmoral Road.

4.2.1 Supralittoral and Backshore Vegetation

The majority of the subject property is well vegetated; a small area has been almost entirely cleared of native vegetation in the space between the house and bluff (Photo 6), and has been maintained as a grass lawn. The rest of the property has suitable cover with native and invasive vegetation growing around the house at the property boundaries on the north, east, and west (Photo 7). Backshore vegetation near property boundaries includes Douglas-fir, young maple trees, Nootka rose, dull Oregon-grape, swordfern, and some Sitka spruce (potentially on the adjacent property). Invasive species on the property included Scotch broom, Himalayan blackberry, and holly. The face of the bluff was sparsely vegetated with alder trees, Scotch broom, and gorse. There has been some slumping on the face of the bluff. One alder near the base of the bluff has tipped downslope as a result of slope failure (Photo 8).

5 OPPORTUNITIES FOR SHORELINE HABITAT IMPROVEMENTS

In addition to general construction BMPs and mitigation measures for work near shorelines (Appendix A), an opportunity exists for improving habitat function of the property and adjacent shoreline. The enhancement is intended to result in a net improvement to the shoreline's biophysical properties following the completion of proposed work. The following are recommendations for enhancement work to be completed on the property and integrated into design objectives:

1. Protect existing native vegetation. Areas of primarily native vegetation remain on the property near the boundaries, and must be clearly delineated prior to development, unless they are deemed hazard trees by a certified arborist.
    a. No vegetation disturbance is anticipated as a result of this development. The vegetation and work area are separated by the steep bluffs.
2. Revegetation of the site within the 15 m setback area. This should be done with a suitable assemblage of native plants. This is detailed in Section 5.1.
3. Removal of invasive species. Most of the invasive species are located on or immediately adjacent to the bluffs. It is recommended that these plants be left in place for safety reasons. Invasive species further backshore can be removed and disposed of at an appropriate facility.

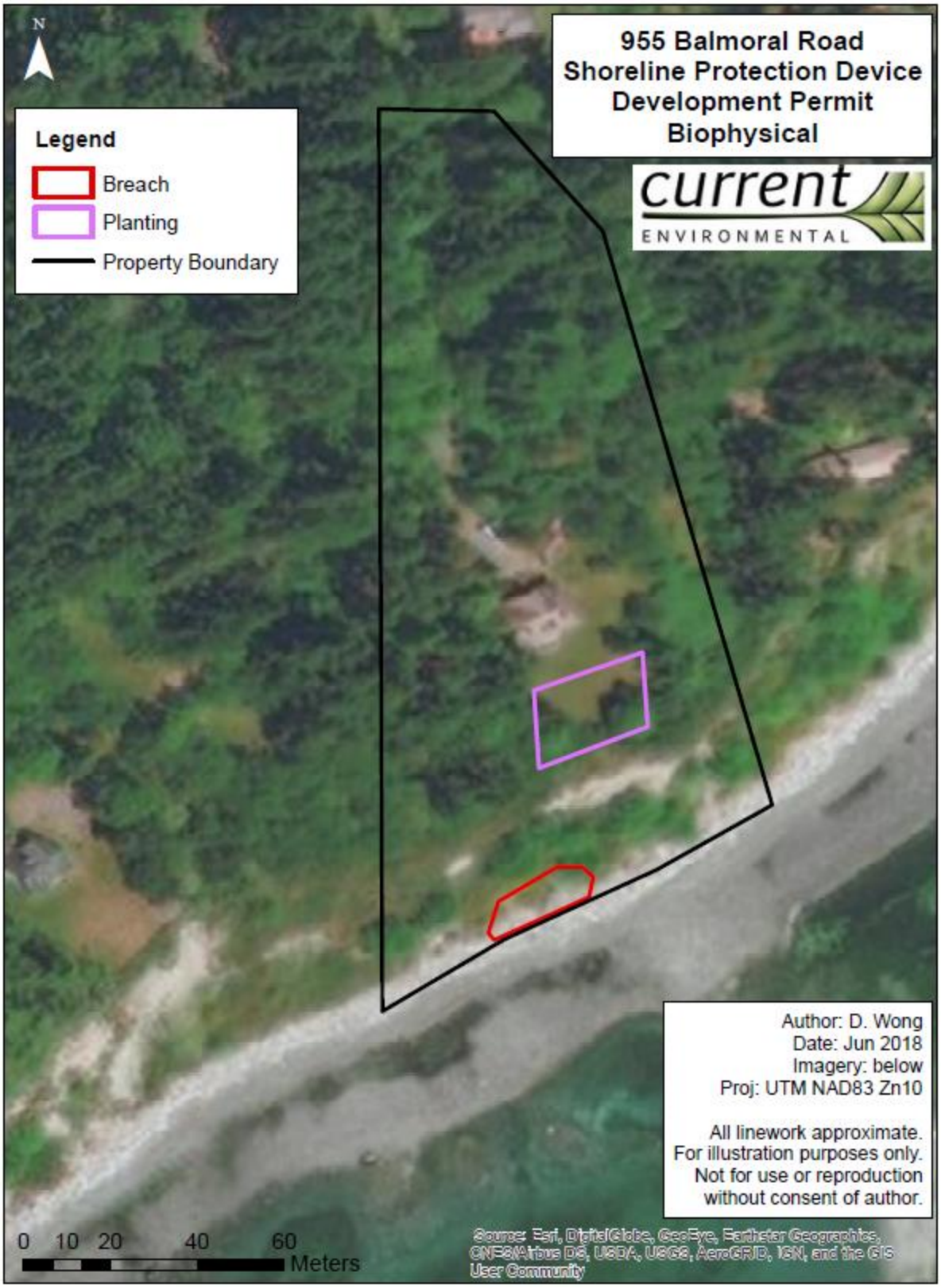


Figure 4. Map showing the approximate locations of the breach and area to be planted.

5.1 PLANTING PRESCRIPTION

There is opportunity to plant native trees and shrubs in the open grassy area adjacent to the top of the bluff. The native plants will provide a vegetative buffer for the steep slope, help restrict pedestrian access, reduce spread of invasive species, and improve habitat function. The property owners intend to install a fence across the cleared area near the bluff and plant native species a safe distance from the top. A planting buffer of approximately 5 m wide is recommended using the following species assemblage, or other suitable native species as recommended by the nursery where species are not available. Labour costs have been included for the purpose of a security bond if required, but planting can be completed by the property owners. It is not recommended that the planting be included as a condition of the development permit, as per CVRD OCP, landscaping is only required where disturbance or alteration of native vegetation is proposed, which will not occur in the scope of this work. This prescription and associated costs have been included at the request of the proponent.

Table 1. Restoration planting recommended species.

Species	Number	Size	Spacing	Cost/Unit	Total Cost
Swordfern	5	1 gal	1 m	$9.00	$45.00
Dull Oregon-grape	5	1 gal	1 m	$9.00	$45.00
Salal	5	1 gal	1 m	$9.00	$45.00
Nootka rose	6	1 gal	1 m	$9.00	$54.00
Evergreen huckleberry	5	1 gal	1 m	$9.00	$45.00
Oceanspray	3	1 gal	1 m	$9.00	$27.00
Douglas-fir	3	2 gal	6 m	$16.00	$48.00
Grand fir	1	2 gal	6 m	$16.00	$16.00
Sitka spruce	2	2 gal	6 m	$16.00	$32.00
Labour	7			$30.00	$210.00
Subtotal					$567.00
Tax					$53.34
Total					$620.34

6 CONCLUSIONS

Environmental constraints affecting development at 955 Balmoral Road are limited to the marine environment and the steep bluffs. There is some suitable spawning substrate for forage fish, and the area is a vital area for herring spawn. No work is planned for the top of the bluff and no vegetation will be disturbed as a result of the work, but the proponent will plant an assemblage of native species to act as a buffer for the bluffs and to restrict pedestrian access to the overhanging edge. Provided the mitigation measures in Appendix B are followed, including completion of forage fish surveys in advance of work, it is anticipated that the proposed work may proceed without causing harm to the environmental features described in this report.

7 CLOSURE

We trust that this assessment has satisfied your requirements to determine the potential effects the proposed rip rap repairs will have on the shoreline adjacent to the subject property.

Please contact the undersigned with any questions or concerns.

Sincerely,

Rupert Wong, R.P. Bio. & Danika Wong, Technologist

PHOTOS

Photo 1. View of the breach in rip rap at the subject property.

Photo 2. Eagles in the tree likely located on neighbouring property to the west.

Photo 3. View of the shoreline adjacent to the subject property looking east.

Photo 4. View of the shoreline adjacent to the subject property looking west. Note the rip rap out of place near foreground (red arrow).

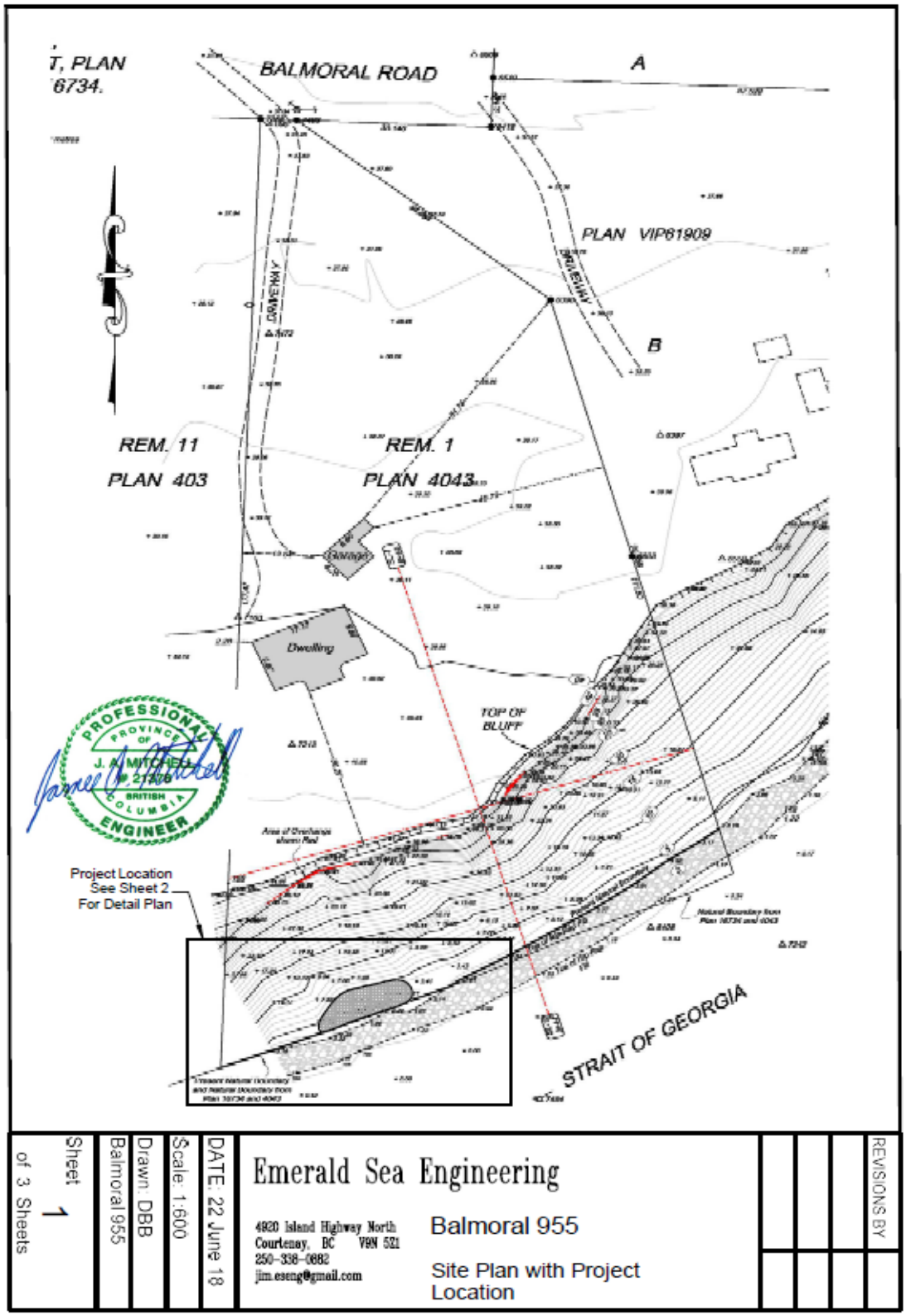
Photo 5. View of the shoreline adjacent to the subject property looking north. Note the breach in rip rap below a slope failure (red arrow).

Photo 6. View of the top of the bluff showing cleared vegetation. Note herring spawn below.

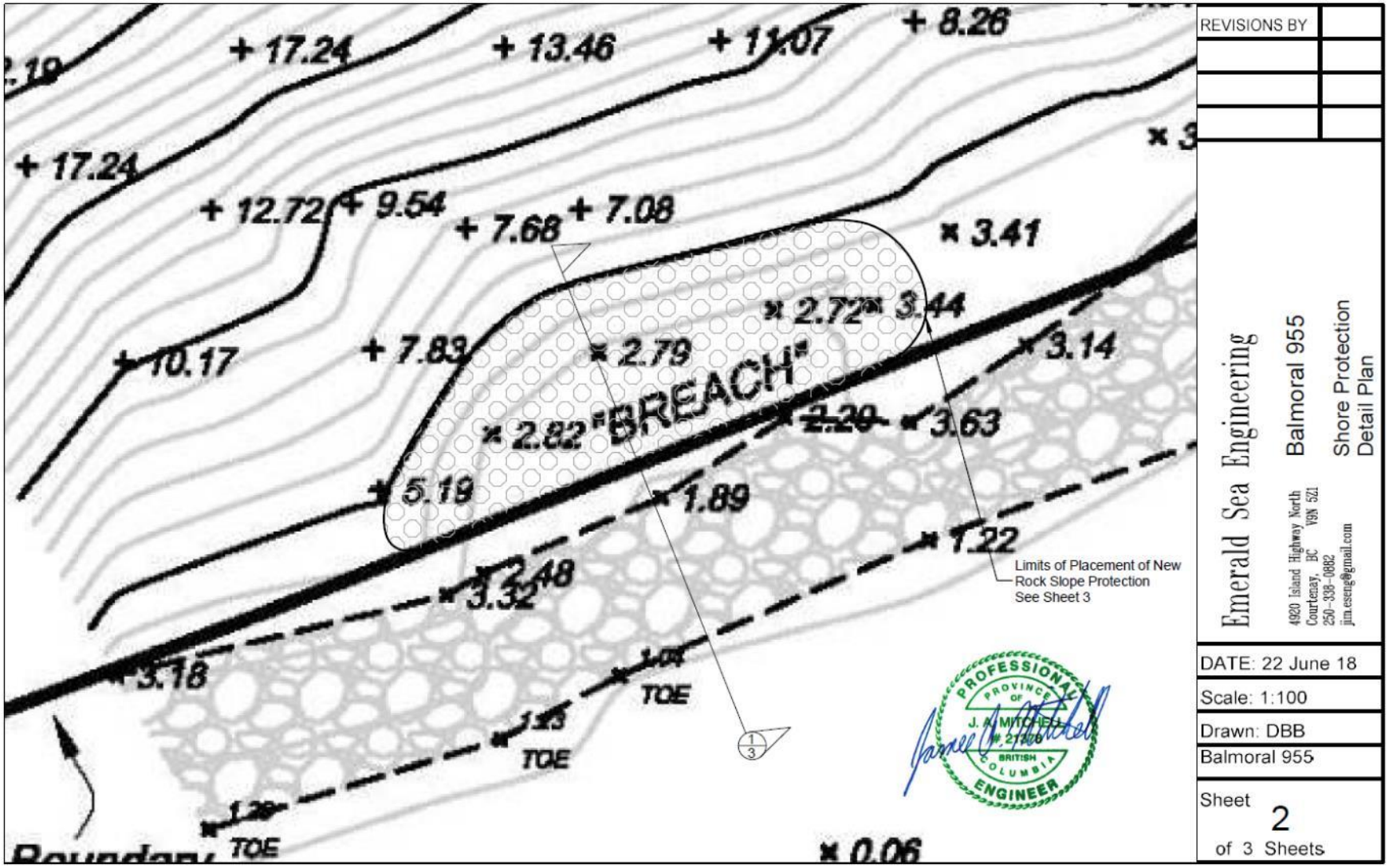
Photo 7. View of the backshore area between the house and the bluff showing clearing and vegetation near property boundaries.

Photo 8. View of a recent slump and slanted alder.

APPENDIX A. RIP RAP REPAIR DESIGN DRAWINGS

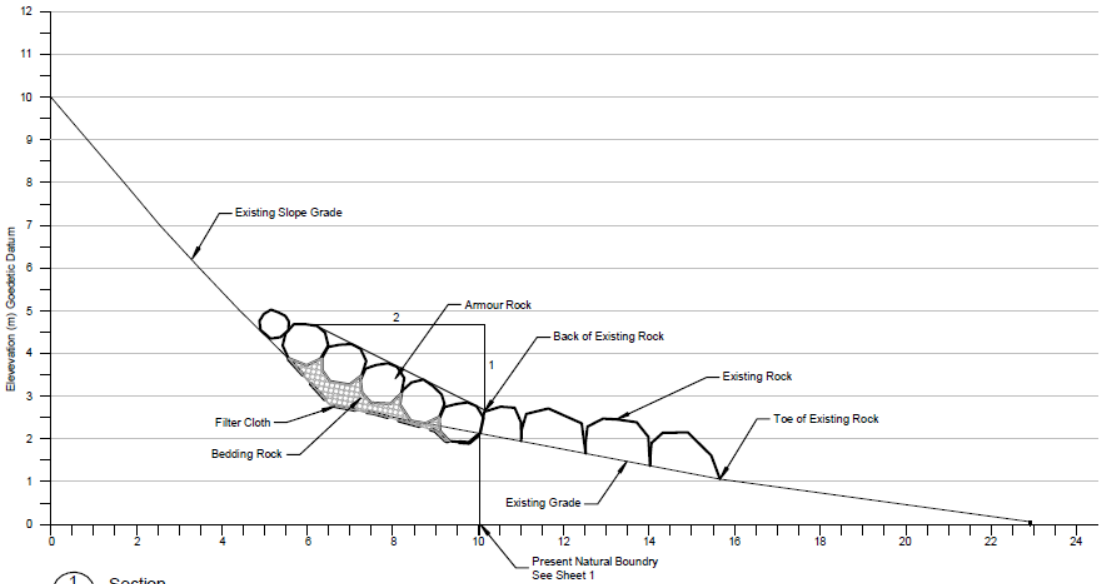


current ENVIRONMENTAL



current ENVIRONMENTAL

General Notes & Specifications:
- Remove Woody Debris
- Excavate Trench for Toe of Rock
- Place Filter Cloth Armtec 400 Non - Woven or Equal
- Place Bedding Rock 300mm Minus Angular Rock
- Place Armour Rock 1m ± 0.2m Measured by Average of 3 Perpendicular Directions, No Single Dimension Less Then 0.6m
- Rock Shall Be Hard Dense Granitic or Basaltic Rock



1/3 Section
Scale 1:100

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA J. A. MITCHELL # 27206

REVISIONS BY	

Emerald Sea Engineering
4920 Island Highway North
Courtenay, BC V9N 5Z1
250-338-0682
jim.eseng@gmail.com

Balmoral 955

Shore Protection Section

DATE: 22 June 18

Scale: 1:100

Drawn: DBB

Balmoral 955

Sheet 3 of 3 Sheets

APPENDIX B. GENERAL CONSTRUCTION MITIGATION MEASURES

SEDIMENT AND EROSION CONTROL

Specific measures to control sediment during construction will include:

a) No machinery is to enter the supralittoral or intertidal shoreline without permission from the EM.
b) Where there is a potential for silt runoff in the proximity of existing marine shoreline, control devices will be installed prior to construction activities commencing.
c) Silt fencing will be used as needed on a site-specific basis to control erosion and contain potential sediment sources.
d) Excavation will be stopped during intense rainfall events or whenever surface erosion occurs affecting the water.
e) Machinery will track across the intertidal area only at low tide and will not enter the water.
f) Soil stockpiles will be placed a minimum of 15 m from any waterbody and in a location where erosion back into the marine environment cannot occur and will not impede any drainage.
g) Soil stockpiles with the potential to erode into waterbodies are to be covered with poly sheeting. Other techniques, such as terracing or surface roughening can greatly reduce surface erosion on steeper slopes.
h) Permanent exposed soil areas and erosion-prone slopes that may potentially erode into waterbodies are to be seeded immediately or covered with geotextile.
i) Clearing will take place immediately prior to excavation and earthworks to minimize the length of time that soils are exposed.

FUELS AND HAZARDOUS MATERIALS

The accidental release of petroleum, oils, hydraulic fluids, lubricants, concrete additives, anti-freeze or other hazardous materials onto land surfaces or into waterbodies is an offence under the Federal *Fisheries Act* and may result in degradation of habitat quality and could be a threat to human health.

Environmental protection procedures for handling and storage of fuels and hazardous materials shall include the following items:

a) A spill kit of appropriate capacity will be on hand at all times when heavy machinery is in use during construction, including during tracking along the intertidal.
b) Each machine should be equipped with a smaller spill kit.
c) All identified spills will be cleaned up immediately, and contaminated soils and vegetation will be removed for appropriate disposal.
d) Heavy machinery operation on/near the shoreline will be equipped with biodegradable fluid packages.
e) Refuelling of equipment is to occur only at designated fuelling stations and located at least 15 m from all waterbodies.
f) All fuel, chemicals, and hazardous materials will be clearly marked.
g) Pumps and jerry cans are to be placed on poly sheeting and sorbent pads to contain spills.
h) All equipment maintenance with the potential for accidental spills (e.g., oil changes, lubrications) will be done on a designated area at least 15 m from any waterbody. Tarps should be laid down prior commencement of work to facilitate clean up.

i) In the event of a spill, the following guidelines should be followed:
    a. Spills to the receiving environment are to be reported to the BC Provincial Emergency Program (1-800-663-3456) if they exceed the reportable limits (e.g. 100 liters of fuel or oil). A report will be made to the City.
    b. Apply sorbent pads and booms as necessary.
    c. Dispose of all contaminated debris, cleaning materials, and absorbent material by placing in an approved disposal site.
j) An example of a detailed spill response plan is appended in Appendix C.

FORAGE FISH

A forage fish survey must be completed in advance of machine access to the intertidal. Forage fish surveys are valid for 7 days only, and will be completed at the subject property, and along the tracking route between the subject property and machine access point at Curtis Road. Works will be timed so as not to coincide with spawning.

APPENDIX C. SPILL RESPONSE PLAN (FOUR PAGES)

Follow these procedures if a spill of fuels, chemicals, or other hazardous materials occurs[10]

CONTACTS

Report major spills (>100 L) of Class 3 Flammable liquids to the Emergency Management BC (EMBC)
1-800-663-3456

9-1-1 FOR EMERGENCY SERVICES

RESPONSE

For spills of *any* volume follow these steps, which are detailed further below:

1) STOP WORK
2) ENSURE HUMAN SAFETY
3) STOP THE FLOW (when possible)
4) SECURE THE AREA
5) CONTAIN THE SPILL
6) NOTIFY
7) CLEAN-UP
8) REPORT
9) DE-BRIEF

1) STOP WORK
2) ENSURE HUMAN SAFETY
   - Assess the situation, never rush in.
   - Warn other people in the immediate vicinity.
   - Determine what product has been spilled.
   - If the spilled product is flammable ensure there are no ignition sources nearby.
   - Wear appropriate personal protective equipment.
3) STOP THE FLOW
   - Act quickly.
   - Stop the flow or spill at its source.
   - Close valves, shut off pumps, or plug holes/leaks.
4) SECURE THE AREA
   - Inform the environmental monitor and construction supervisor of the spill.
   - Limit worker access to spill area.
   - Prevent public entry to the site.
5) CONTAIN THE SPILL

[10] Adapted from BC Transmission Corporation (BCTC) Spill Response Procedures.

- Prevent spillage from entering drainages (watercourses, ditches, culverts, drains).
- Use ample spill sorbent material to contain the spill.
- As necessary, use a dyke, pumping into containment structures, or other method to prevent discharge from the site.
- Make every effort to minimize contamination.

6) NOTIFY
   - When necessary (spills of flammable materials >100L) the first external call should be made to: Emergency Management BC (EMBC) 1-800-663-3456 (24 Hour)
   - Provide necessary spill details to other external agencies
7) CLEAN-UP
   - The environmental monitor will be responsible to ensure that clean-up methods comply with Ministry of Environment requirements including the *Environmental Management Act* and Regulations.
   - All material and equipment used in clean-up (e.g. used spill containment material, and sorbent pads) are to be disposed of appropriately.
   - Soils or other materials contaminated by the spill will be treated as special wastes and be disposed of as required on a site-specific basis. Residue sampling may be required in association with soil contamination to ensure complete removal and/or treatment.
8) REPORT
   - Complete an Environmental Incident Report (EIR).
   - The EIR will be submitted to MoTI/MoE/DFO (or any other pertinent regulatory agencies), and copies will be retained by the EM and construction supervisor.
9) DE-BRIEF
   - Following the clean-up of a spill the construction supervisor will call a meeting with all personnel to discuss the following as a means to inform future prevention and spill management techniques:
     - Identify the source of the spill and whether it could have been avoided.
     - Review the sequence of events used to handle the spill, including what was done right/wrong.
     - Determine whether the equipment used to handle the spill was available when needed and in sufficient quantity.
     - Discuss how the spill response procedure could be improved.

Spill Reporting Notification Chart

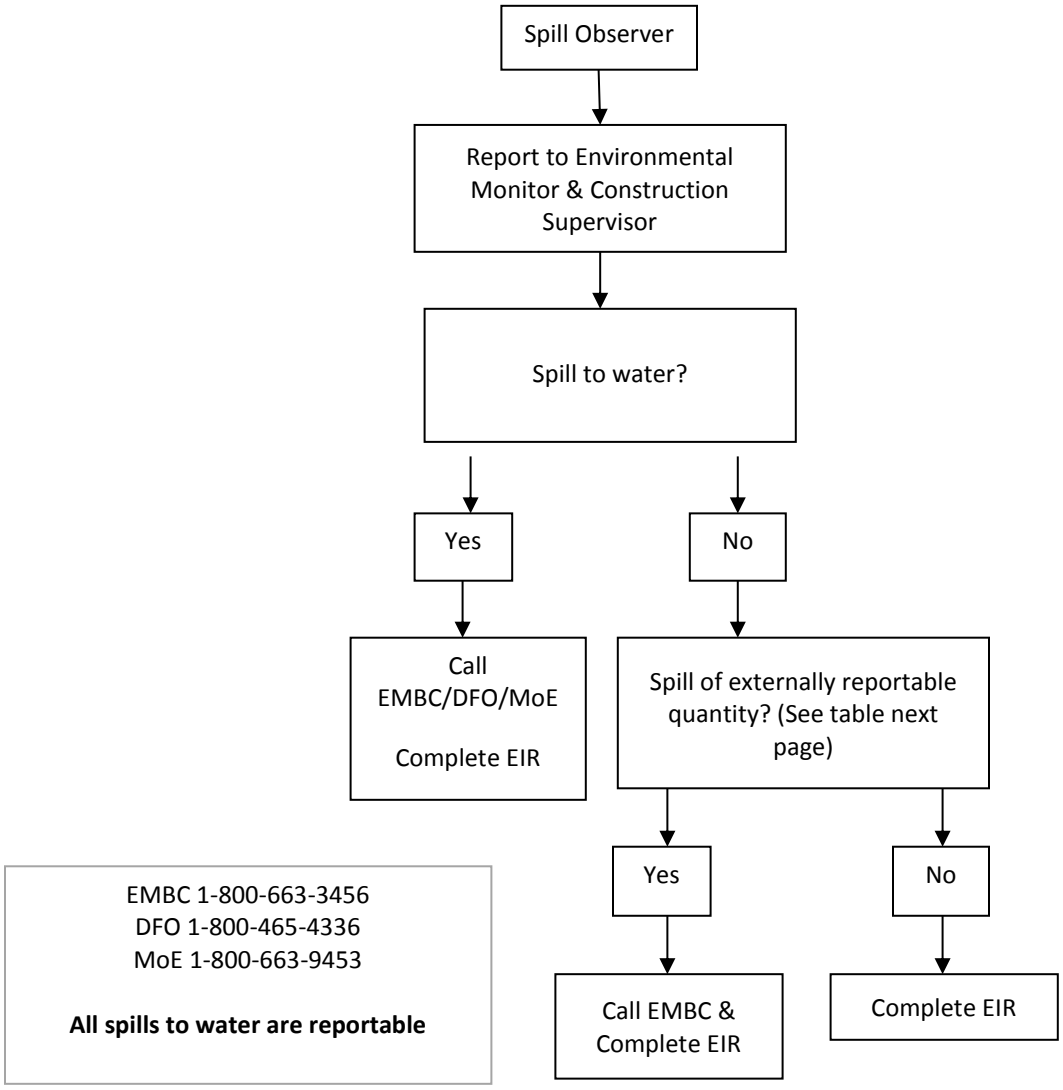


Table of Reportable Levels of Certain Substances

(Adapted from *Environmental Management Act* – Spill Reporting Regulation)

	Substance	Specified Amount
1	Class 1, Explosives	Any quantity that could pose a danger to public safety or
2	Class 2.1, Flammable Gases, other than natural gas	10 kg
3	Class 2.2, Non-Flammable and Non-Toxic Gases	10 kg
4	Class 2.3, Toxic Gases	5 kg
5	Class 3, Flammable Liquids	100 L
6	Class 4, Flammable Solids	25 kg
7	Class 5.1, Oxidizing Substances	50 kg or 50 L
8	Class 5.2, Organic Peroxides	1 kg or 1 L
9	Class 6.1, Toxic Substances	5 kg or 5 L
10	Class 6.2, Infectious Substances	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
11	Class 7, Radioactive Materials	Any quantity that could pose a danger to public safety and an emission level greater than the emission level established in section 20 of the "Packaging and Transport of Nuclear Substances Regulations"
12	Class 8, Corrosives	5 kg or 5 L
13	Class 9, Miscellaneous Products, Substances or Organisms	25 kg or 25 L
14	waste containing dioxin	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
15	leachable toxic waste	25 kg or 25 L
16	waste containing polycyclic aromatic hydrocarbons	5 kg or 5 L
17	waste asbestos	50 kg
18	waste oil as	100 L
19	waste containing a pest control product	5 kg or 5 L
20	PCB Wastes	25 kg or 25 L
21	waste containing tetrachloroethylene Regulation	50 kg or 50 L
22	biomedical waste	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
23	A hazardous waste	25 kg or 25 L
24	A substance that can cause pollution	200 kg or 200 L
25	Natural gas	10 kg, if there is a breakage in a pipeline or fitting operated above 100 psi that results in a sudden and uncontrolled release of natural gas

*Refer to Transportation of Dangerous Goods Regulation under the *Transportation of Dangerous Goods Act* for substance definitions.

** If there is any doubt regarding the substance spilled, specified amount, or whether it is reportable, take a cautious approach and report it.

END – Spill Response Plan

Lewkowich Engineering Associates Ltd.
geotechnical • health, safety & environmental • materials testing

GEOTECHNICAL EVALUATION

for

SINGLE FAMILY RESIDENCE
955 BALMORAL ROAD, COMOX VALLEY REGIONAL DISTRICT, BC

Prepared for:

MR. BRUCE RENOOY

Prepared by:

Mr. J. Fischer, P.Eng.

Reviewed by:

Mr. Chris Hudec, M.A.Sc., P.Eng.

of

Lewkowich Engineering Associates Ltd.

1900 Boxwood Road, Nanaimo, B.C., Canada V9S 5Y2 • Tel: (250) 756-0355 Fax: (250) 756-3831
www.lewkowich.com

Table of Contents

Attachments

Lewkowich Engineering Associates Ltd.
geotechnical • health, safety & environmental • materials testing

Bruce Renooy
176 Butchers Road
Comox, BC
V9M 3X1

File Number: F5651.01r1
Date: July 16, 2018

PROJECT: **955 BALMORAL ROAD, COMOX, BC**

SUBJECT: **GEOTECHNICAL ASSESSMENT – STEEP SLOPE HAZARD**

LEGAL DESCRIPTION: **LOT 1, DISTRICT LOT 140, COMOX DISTRICT, PLAN 4043, EXCEPT THAT PART IN PLAN 16734**

Dear Mr. Renooy:

1. INTRODUCTION

As requested, Lewkowich Engineering Associates Ltd. (LEA) conducted a slope assessment for the above noted property. This report summarizes our observations and design, and provides our comments, recommendations, and conclusions.

2. BACKGROUND

a. LEA understands that the proposed development consists of major renovations to the existing residence. These renovations include an addition within the footprint of an existing covered patio on the south side as well as an attached garage. This addition will decrease the building setback from the top of the bank by approximately 2m. We understand that renovation plans are preliminary and subject to change.

b. Topographic data and legal surveys were prepared by Grant Land Surveying Inc. Elevations in this report and attached drawings are referenced to the Canadian Geodetic Datum CGG2013.

c. LEA reviewed a shore protection report authored by Jim Mitchell of Emerald Sea Engineering (dated June 27, 2018). We understand the proposed foreshore revetment repairs will consist of additional rip rap placed over bedding rock on non-woven geotextile fabric, on the landward side of the existing rip rap installation.

3. ASSESSMENT OBJECTIVES

a. Our assessment, as summarized within this report, is intended to meet the following objectives:

i. Certify that the land is considered geotechnically safe and suitable for the use intended (defined for the purposes of this report as major renovations, including an addition to an existing residence), with the probability of a geotechnical failure resulting in property damage of less than 10 percent (10%) in 50 years, with the exception of geohazards due to a seismic event which are to be based on a less than 2 percent (2%) probability of exceedance in 50 years, provided the recommendations in this report are followed.

ii. Identify any geotechnical deficiency that might impact the design and construction of the development, and prescribe the geotechnical works and any changes in the standards of the design and construction of the development that are required to ensure the land, buildings, and works and services are developed and maintained safely for the use intended.

iii. Provide geotechnically related recommendations with regard to slope stability, storm water management, and seismic site class.

4. ASSESSMENT METHODOLOGY

a. The geotechnical investigation was carried out on March 21 and 28, 2018. LEA surveyed exposed soil strata within the slope, measured setbacks to existing buildings, and reviewed geotechnical reports from nearby properties. Soil parameters were inferred from local experience on nearby projects, geotechnical reports (by others), and published literature.

b. Slope stability was evaluated with GeoStudio's Slope/W limit equilibrium software (version 8.16.4.14710). A Morgenstern-Price analysis was applied to determine Factors of Safety (FoS) under static and seismic conditions.

c. Factors of safety are ratios between forces preventing failures and forces driving failure.

Factors of Safety equal to 1 indicate that forces are balanced. Factors less than 1 indicate a strong likelihood of failure. A generally accepted FoS for residential developments is 1.5 under static conditions and 1.2 under seismic conditions. Rotational failure modes were assumed for global stability analyses.

d. The seismic behaviour of the soil mass was analyzed using Bray's Simplified Procedure for Estimating Earthquake-Induced Deviatoric Slope Displacements. Slope displacement estimates were based on the seismic acceleration yield coefficients obtained from Slope/W models. The maximum suggested displacement for normal residential construction is 15cm. Note that the primary objective is to provide an acceptable level of safety for building occupants during a seismic event. Although extensive structural damage may occur during the design event, there is a reasonable degree of confidence that the building will not collapse, and occupants are able to egress.

e. Peak flows for pre and post development were estimated using the Rational Method.

$$Q = f \times C \times I \times A$$

Where: Q = Peak flow, f = frequency factor (1.1 for 25 year return period), C = runoff co efficient calculated using weighted average of surface type/area, A = Area

f. Short duration rainfall intensity-duration-frequency (IDF) data was obtained for Comox - A Station No. 1021830. Flow paths were inferred from a topographic survey provided by the Client.

g. Peak flows were estimated for pre and post development. A stormwater dispersal trench was then sized according to the difference in pre and post development flows and building roof area. The sizing considered storage volume and estimated soil infiltration capacity.

5. SITE CONDITIONS

5.1. General

a. The civic address of the proposed development property is 955 Balmoral Road, within the Comox Valley Regional District. The subject site is zoned Rural Eight (RU-8) and is accessed from the east terminus of Balmoral Road. Surrounding land use is residential.

b. The subject site slopes up from north to south at grades ranging from 2 to 5%. The south quarter of the lot is dominated by a 40m high bluff with an average slope of approximately 45° above horizontal. Localized slope angles range from 35° to near vertical.

c. The lot contained a single-family residence, a garage building, and a septic field. The residence is horizontally offset 32m from the top of the bank. The existing covered patio was offset 30m from the top of the bank.

d. The toe of the foreshore slope was armoured with angular rip rap with diameters up to 1.5m. Armouring rock appeared to have been shifted and displaced by wave action. Individual rocks were subject to weathering, as indicated by rounded edges.

e. The property is mostly grass covered with isolated deciduous trees and a forested perimeter of mature coniferous trees. Several deciduous stumps were noted along the top of the bank. The foreshore slope is vegetated with isolated copses of deciduous trees, bushes, and grasses. Trees on the slope showed signs of actively creeping due to over steepened conditions. The terrace immediately north of the rip rap was littered with fallen trees.

5.2. Soil Conditions & Groundwater

a. Local surficial geology is dominated by marine and glacio marine deposits founded on ground moraine deposits. For descriptive purposes, observed subgrade soils have been grouped into the following four units: Sandy Overburden, Sandy Gravel Veneer, Glacial Till, and Quadra Sand.

b. Sandy Overburden consisted of loose to compact, medium brown sand with traces of silt and gravel, as well as organics. This layer was 1m thick at the top of the bank and formed the root horizon. This material may be reused for landscaping but should be stripped within foundation and other load bearing footprints.

c. Sandy Gravel Veneer was approximately 1.5m thick and consisted of light brown, compact to dense sandy gravel. This material would provide a suitable foundation bearing grade. This material may be suitable for re-use as an engineered fill material, provided the recommendations in this report regarding the placement and compaction of fill materials are followed. Additional on-site assessment, soil classification, or laboratory testing may be necessary to determine the overall suitability of the material prior to placement as a fill soil.

d. Glacial Till was observed below the Sandy Gravel. This deposit varies in thickness and gradation but is generally composed of sand with gravel and cobbles, and some to traces of silt. These soils are very dense in an undisturbed state and would provide a suitable foundation bearing grade. We do not recommend reusing these soils as structural fill as they may be very moisture sensitive.

e. Quadra Sands consisted of dense, horizontally stratified sands, silty sands, and varying gradations of silt and clay. What appeared to be inclusions of till like deposits with gravel and cobbles were also noted in the exposed slope face. These deposits varied in thickness through the site but were approximately 25m thick within the surveyed section of the slope face.

f. Depths are referenced to the existing ground surface at the time of our field investigation. 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.

5.3. Groundwater

a. Soil units above the Quadra Sands appeared to be moderately well drained. Evidence of groundwater seepage was observed within the lower half of the Quadra unit. Seepage points appeared to be perched on less permeable, finer grained strata. Isolated and decimeter scale piping failures were noted in several areas within the Quadra unit.

b. Water tables just above sea level of the Georgia Strait were adopted for the slope stability analysis.

c. Groundwater levels can be expected to fluctuate seasonally with cycles of precipitation and tides. Groundwater conditions at other times and locations can differ from those observed pits at the time of our assessment.

6. SLOPE STABILITY DISCUSSIONS

6.1. Types of Failure

a. The potential failures along this shoreline can be classified into three dominant modes of failure including:

   i. Minor sloughing and slab failures,

   ii. Piping or blowout failures, and

   iii. Block failure.

b. Piping or blowout failures are caused by subsurface erosion in sand and silt soils. Uniformly graded sand strata such as those found in the Quadra Formation are particularly susceptible to this mode of failure. Larger scale piping failures can be identified by 'U' shaped scarps when seen in plan view.

c. Minor sloughing and slab failures are smaller scale failures that will often occur on over-steepened areas of a slope that are subject to stress relief, pore pressure dissipation, softening due to weathering, concentrated run off, and weathering due to precipitation. For the

purposes of this report, minor surficial sloughing may be defined as sliding vegetation cover or exposed surficial soils with up to 1m thickness of underlying soil. Seepage and surface flows appear to have triggered minor sloughing and small scale slab failures at the subject site. These failures are very likely to continue on the unvegetated side slopes until a stable angle of repose has been attained.

d. Block failures are larger scale, deep seated failures that are represented in the slope analysis as rotational failures and translational failures. These failures are influenced by over-steepened slopes, erosion at toe of slopes, weak units in the Quadra sediments, and high piezometric levels associated with Quadra sediments. Block failures have been addressed in this report through a slope analysis of rotational failures.

6.2. Factors Affecting Slope Stability

Several factors affecting the slope stability of the site have been considered:

a. Groundwater Conditions

Groundwater flow and hydraulic pressure can have significant impact on the slope stability. Poorly graded sands within the Quadra unit are typically well drained due to higher permeability. Although groundwater flows may contribute to localized instability, it does not appear to be the primary factor at this site.

b. Shoreline Erosion

Without protection, recession of the bank toe can also significantly reduce the slope safety factors over time. We understand that the original toe of the bank was subject to severe erosion from wave and tidal action. The toe of the bank has since been protected from significant erosion by the installation of a rip-rap structure. It is critical for this structure to be maintained in order to mitigate bank recession.

c. Seismic Shaking

Significant levels of seismic shaking may temporarily lower the factor of safety. In evaluating

the seismic case, we use a less than 2% in 50 year seismic event based on the current 2012 BC Building Code. Seismic analysis is conducted based on a displacement-based slope stability assessment method, provided in APEGBC's Guidelines for Legislated Landslide Assessments for Proposed Residential Development in BC, 2008.

7. STORMWATER MANAGEMENT DISCUSSIONS

7.1. Streams and Aquatic Habitat

The shoreline bounding the south side of this property consisted of a shallow sloped, gravel and sand beach. This shoreline appears to fall within a moderate to high energy zone, with the most significant wave action originating from the longest fetch to the south east. Beach sediments range in size from sand to cobbles and boulders. A review of previous studies, air photos, and satellite imagery indicated a general trend of sediment being transported towards Goose Spit to the south west.

7.2. Flow Patterns and Water Quality

a. The catchment area considered for this site begins at the top of the bank and extends to the north property boundary. Existing surface flows infiltrate into the permeable sand and gravel subgrade soils that extend at least 2.5m below ground surface. Groundwater flows are inferred to flow in a southerly direction, towards the foreshore. Surface flows are expected to follow topographic contours in a northerly direction towards the forested areas.

b. Post-development flows are expected to follow almost identical patterns as long as the current surface grades are not significantly altered. Storm water from the residence roof and foundation dewatering will be conveyed to a stormwater infiltration pit (as per attached figures). This installation will attenuate post development flows and mitigate the risk of turbid flows into foreshore habitats.

c. LEA observed little indication of erosion or preferential flow paths throughout the study area. No signs of turbid flows were observed on the foreshore.

d. We do not expect changes to the water quality of post development run off if our recommendations are adhered to. Infiltration facilities will prevent turbid storm flows from the building and will reduce the potential for hydraulic point loads on the ground surface.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. General

a. From a geotechnical point of view, the land is considered safe for the use intended (defined for the purposes of this report as major renovations, including an addition to an existing residence), with the probability of a geotechnical failure resulting in property damage of less than 10 percent (10%) in 50 years, with the exception of geohazards due to a seismic event which are based on a less than 2 percent (2%) probability of exceedance in 50 years, provided the recommendations in this report are followed.

b. The primary cause of slope instability at this site is due to over steepened slopes. The top of the bank will continue to recede until the slope reaches a natural angle of repose. We recommend a minimum horizontal setback of 32m from the top of the bank, for new construction. Horizontal setbacks for the addition on the south side of the house may be reduced to 29m if the foundations bearing grade is 1.5m below current surface grades.

c. From a slope stability standpoint we have no objections to the proposed repairs to the existing rock revetment at the toe of the slope. Hardscape protection at the toe of the slope promotes slope stability be mitigating undermining of the toe caused by wave action.

8.2. Slope Stability

a. Slope analysis results for pre and post development scenarios are summarized in the table below. Analyses typically consider minimum safety factors of 1.5 for the static case, and 1.2 for the seismic case (at the house). Slope assessment sections have been appended to this report.

b. The *Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British*

Columbia, (2008) specify that if soil liquefaction or strain softening is not an issue, the factor of safety and/or the amount of slope displacement can be estimated by the methods provided by the guideline. The maximum suggested displacement for normal residential construction is 15cm. The structural design of a residential building may be modified to accommodate larger displacements.

Table 1 – Slope Stability Factors of Safety (FoS) at the south side of the existing house

Seismic Factor	**Factor of Safety**	**Estimated Ground Displacement**
0	1.445	
0.5 *PGA	1.144	
PGA	0.918	
0.238	1.001	9.6 cm
*Peak Ground Acceleration		

c. The following recommendations should be considered for the proposed development:

i. Vegetation shall be maintained wherever possible on the slope face, as well as within the setback distance, as an erosion control measure. Please note that we have no objection, from the geotechnical aspect, to tree removal at the slope crest, or on the slope within three metres (as measured vertically) of the crest, since these trees could represent a surcharge. However, stumps shall be left in place, and vegetation planting (which may consist of low ground cover vegetation) should be undertaken as soon as practicable.

ii. Fill within the setback area and dumping on the slope shall be prohibited. Grading shall be done in a manner that does not allow concentrated overland flow towards the slope face. Finished surface grades should facilitate sheet flow of storm water.

iii. Ponds or swimming pools, in-ground lawn irrigation systems should be discouraged in proximity to any slopes. An experienced and qualified geotechnical engineer should evaluate and approve such installations.

iv. The slope is generally over-steep and subject to ongoing ravelling or spalling. In addition, surface sloughs are expected in local over-steep area covered with slumped debris. Therefore, property owners should be made aware of the potential for ongoing erosion of a localized nature, and should be prepared to maintain local drainage that allows positive flow without soil loss through erosion. In addition, existing vegetation cover growth shall be encouraged and be maintained in a dense condition.

8.3. Seismic Issues

a. No compressible or liquefiable soils were encountered during the field investigation. Poorly graded sands observed within the Quadra unit are typically dense and dilatant.

b. Based on the 2012 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 the test pitting investigation would be "Site Class D" (Stiff Soil).

8.4. Storm Water Management

a. The table below provides our estimates of peak storm water runoff discharge rate during a 25-year storm event. The calculations were performed using the rational method, which is commonly used to size storm sewers, channels, and other storm water structures that can handle runoff from drainage areas less than 80 hectares. The outlet for this analysis was assumed to be where the driveway crosses the south west property boundary.

b. The attached infiltration facility design was sized for the roof drainage and foundation drainage flows. The increase in post development peak flows was due to the addition of the garage roof area.

Table 1 – Estimated peak flows for a 1 hour 25 year event	
Pre-Development	28.3 m^3/h
Post Development	29.2 m^3/h
Infiltration Pit Capacity	2.4 m^3

c. It is LEA's opinion that the proposed development will have a minimal impact on the surface and ground water flow patterns of the property. Subgrade soils consist of permeable, sands and gravels. The majority of stormwater north of the Present Natural Boundary (PNB) will either infiltrate into subgrade soils or flow northwards through grassed and forested areas.

d. Storm water within the subject site shall be controlled by closed, non-perforated piping. This includes runoff from roadways, roof areas, and ancillary pavements such as patio "hardscape" and driveways. This recommendation is intended to minimize as much as practicable the surface water flows upland from the ocean-facing slope. Satisfactory site drainage is also dependent on final lot grading. It is also recommended that final lot grading (2% minimum grade) direct the water at least 2m away from the building perimeters and the top of bank to a suitable discharge area. Splash pads should be used at the rainwater leader outlets if overland flow is used to convey the storm water.

9. GEOTECHNICAL ASSURANCE AND QUALITY ASSURANCE

The 2012 British Columbia Building Code requires that a geotechnical engineer be retained to provide Geotechnical Assurance services for the construction of buildings. Geotechnical Assurance services include review of the geotechnical components of the plans and supporting documents, and responsibility for field reviews of these components during construction.

10. ACKNOWLEDGEMENTS

Lewkowich Engineering Associates Ltd. acknowledges that this report may be requested by the building inspector (or equivalent) of the Comox Valley Regional District as a precondition to the issuance of a building 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 for, and at the expense of the Client. We have not acted for or as an agent of the Comox Valley Regional District in the preparation of this report.

11. LIMITATIONS

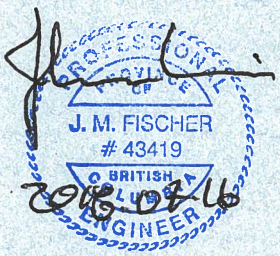
a. The conclusions and recommendations submitted in this report are based upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction or further investigation. The recommendations given are based on the subsurface soil conditions encountered during the test pitting and drilling programs, current construction techniques, and generally accepted engineering practices. No other warrantee, expressed or implied, is made. Subgrade conditions are known only at the test pit and borehole locations and have been used to infer conditions throughout the site in preparation of this report. If unanticipated conditions become known during construction or other information pertinent to the development become available, the recommendations may be altered or modified in writing by the undersigned.

b. The designs presented in this report were prepared for the exclusive use of the Client. The use of these plans by any others shall be approved in writing by the Geotechnical Engineer prior to construction.

12. 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.



Johannes Fischer, P.Eng.
Geotechnical Engineer

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

13. REFERENCES

1. Association of Professional Engineers and Geoscientists of British Columbia, *Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC,* May 2010.

2. Bray, Jonathan D. and Thaleia Travasarou, *Simplified Procedure for Estimating Earthquake-Induced Deviatoric Slope Displacements*, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, April 2007.

3. CGS, *Canadian Foundation Engineering Manual, 4th ed.*, Canadian Geotechnical Society, Vancouver, 2006.

4. Clague, J.J., *Quadra Sand: A Study of the Late Pleistocene Geology and Geomorphic History of Coastal Southwest British Columbia*, Geological Survey of Canada: Department of Mines and Technical Surveys Canada, 1977.

5. Mitchell, Jim, *Coastal Engineering Design Shore Protection 955 Balmoral Avenue, Comox,* Emerald Sea Engineering, 27 June 2018.

6. Savage, W.M., Morrisey, M.M., and R.L. Baum, "*Geotechnical Properties for Landslide-Prone Seattle Area Glacial Deposits*", US Geological Survey, 2000.

TOPOGRAPHIC SITE PLAN ON LOT 1, DISTRICT LOT 140, COMOX DISTRICT, PLAN 4043, EXCEPT THAT PART IN PLAN 16734.

Parcel Identifier: 006-149-341

10 0 10 20 30 40 50 metres

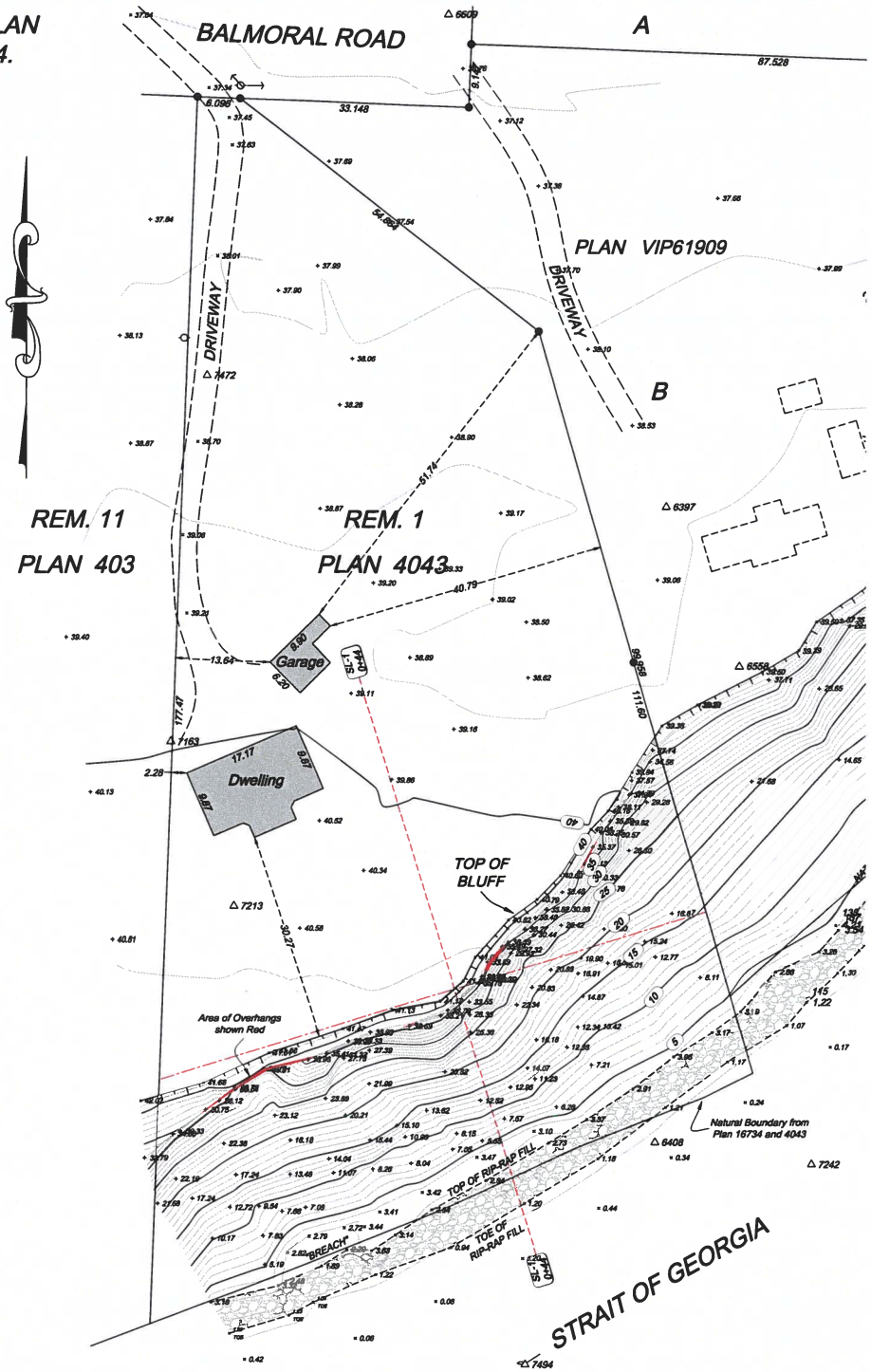
1:500

Legend

- top bank
- standard iron post found
- standard traverse hub placed
- hydro pole
- anchors
- +23.52 elevation point

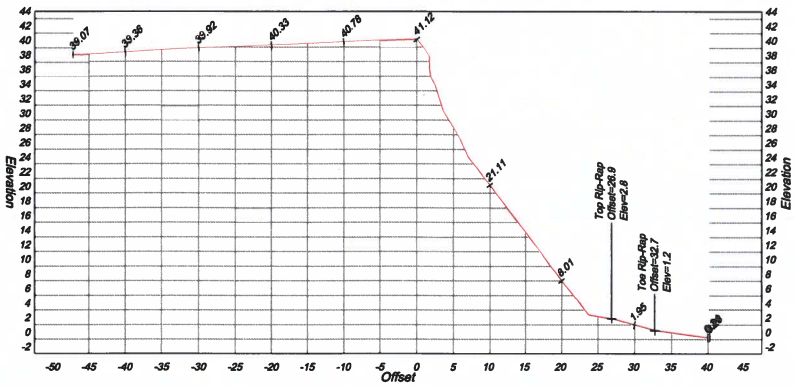
Bearings are NAD 83 grid bearings, derived from differential GPS observations and are referred to the central meridian of Zone 10 (123° West).

Elevations on this plan are referred to Geodetic datum CGG2013.



Section SL-1

Horizontal Scale 1:500
Vertical Scale 1:500



Date of Survey: Jan. 24/18

Civic Address
955 Balmoral Ave
Comox, BC

This document shows the registered dimensions of the above described property and the relative location of the surveyed structures and features with respect to the property boundaries. This document shall not be used to define property lines or property corners.

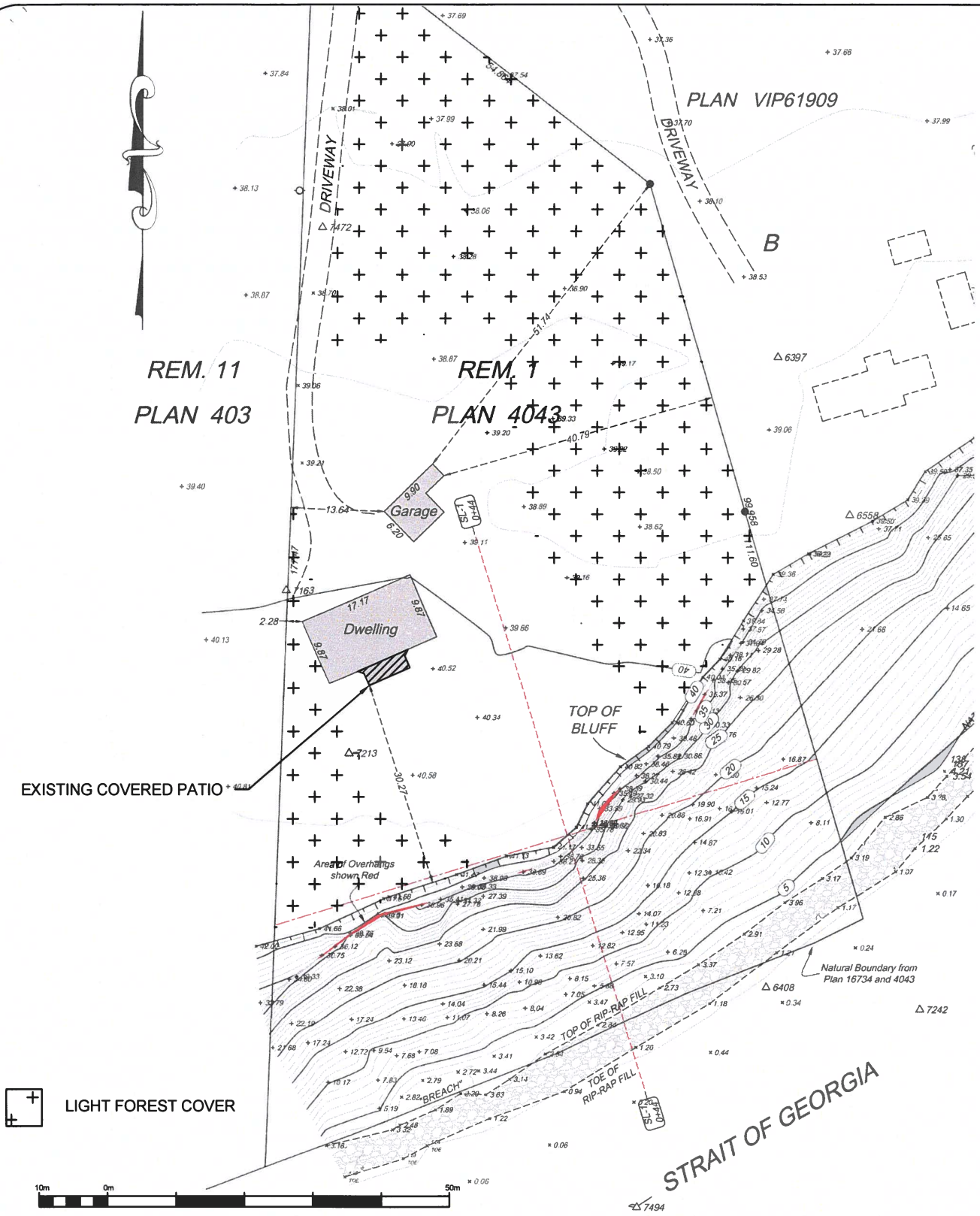
DN: c=CA, cn=Donald Grant 364AG6, o=BC Land Surveyor, ou=Verify ID at www.juricert.com/LKUP.cfm?id=364AG6
Date: 2018.01.31 16:01:13 -08'00'

_____, BCLS

This document is not valid unless originally signed and sealed.

GRANT LAND SURVEYING INC.
1-1941 COMOX AVENUE
COMOX, B.C. V9M 3M3
WWW.GRANTGEOMATICS.COM

FILE:



REV No.	DATE	BY	P.Eng.	REVISION DESCRIPTION

DRAWING TITLE
PRE-DEVELOPMENT SITE PLAN

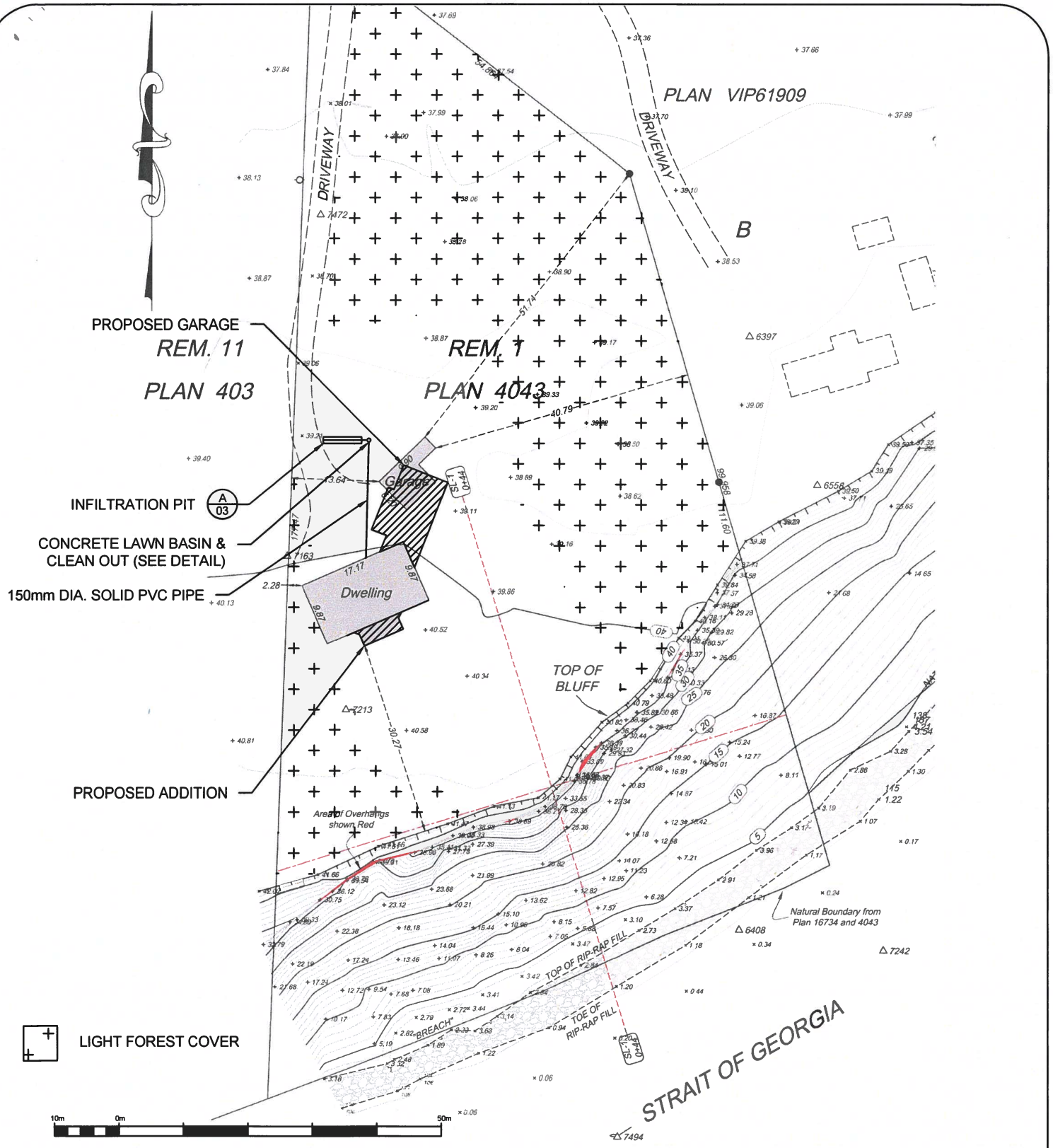
PROJECT NAME
RENOOY RESIDENCE
955 BALMORAL ROAD, COMOX

LEGAL DESCRIPTION
LOT 1, DISTRICT LOT 140, COMOX DISTRICT
PLAN 4043, EXCEPT THAT PART IN PLAN 16734

ENGINEER'S SEAL

PLOT DATE	DRAWN BY
2018-04-05	JF
REVIEWED BY	SCALE
CMH	--
PROJECT No.	DRAWING No.
F5651	01

LEA
Lewkowich Engineering Associates Ltd.



REV No.	DATE	BY	P.Eng.	REVISION DESCRIPTION

DRAWING TITLE
POST DEVELOPMENT SITE PLAN

PROJECT NAME
RENOOY RESIDENCE
955 BALMORAL ROAD, COMOX

LEGAL DESCRIPTION
LOT 1, DISTRICT LOT 140, COMOX DISTRICT
PLAN 4043, EXCEPT THAT PART IN PLAN 16734

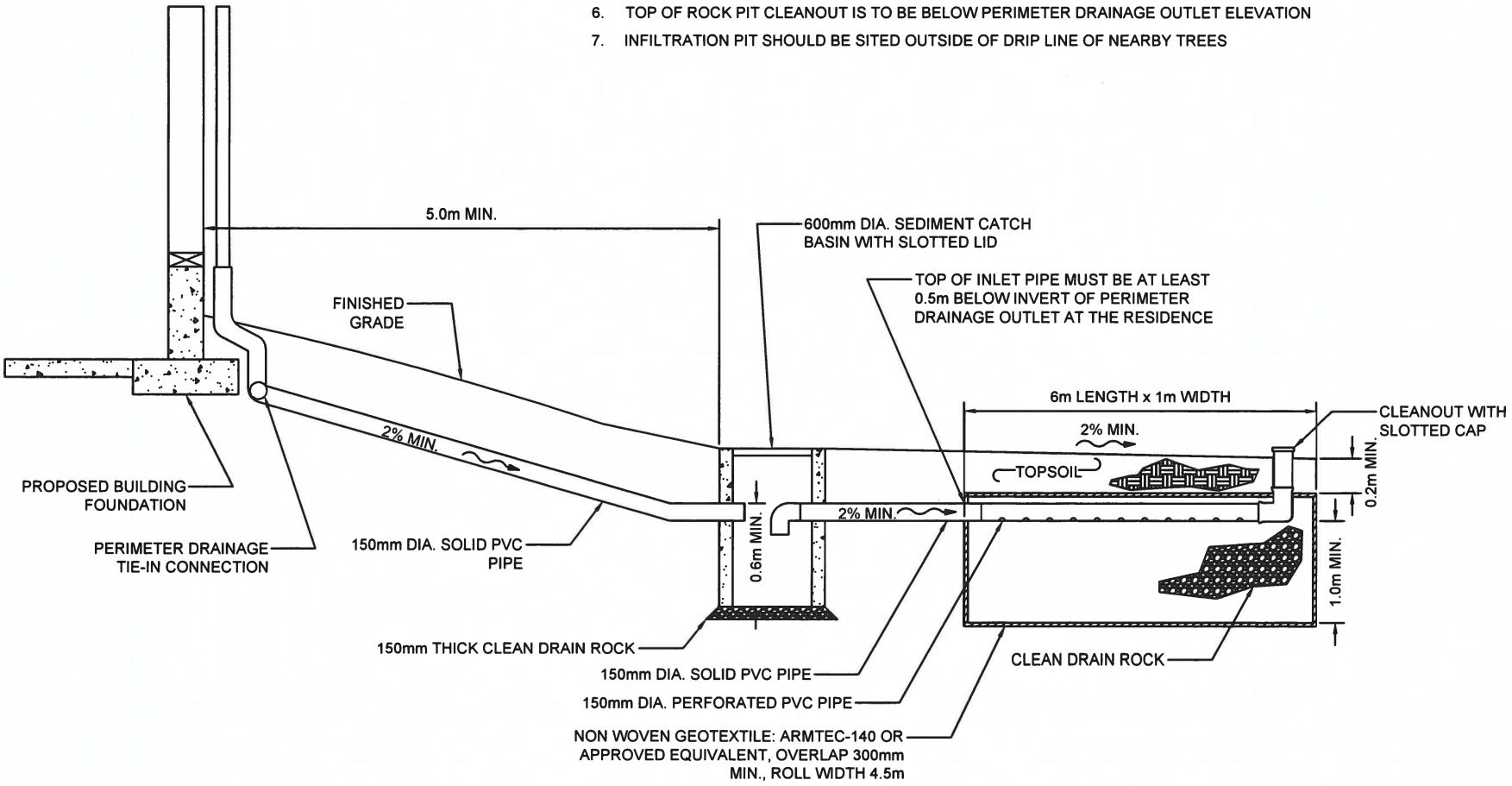
ENGINEER'S SEAL

PLOT DATE	DRAWN BY
2018-04-05	JF
REVIEWED BY	SCALE
CMH	--
PROJECT No.	DRAWING No.
F5651	02

LEA
Lewkowich Engineering Associates Ltd.

NOTES:

1. ROCK PIT MUST BE OFFSET AT LEAST 5m HORIZONTALLY FROM ANY BUILDING FOUNDATION
2. DRAIN ROCK MUST BE COMPLETELY WRAPPED WITH NON WOVEN GEOTEXTILE
3. ROCK PIT MUST HAVE MINIMUM PLAN AREA OF 6m ²
4. PLAN DIMENSIONS OF ROCK PIT MAY BE MODIFIED TO ACCOMMODATE SITE CONSTRAINTS
5. LONG SIDE OF ROCK PIT IS TO RUN PARALLEL TO GROUND COUNTOURS
6. TOP OF ROCK PIT CLEANOUT IS TO BE BELOW PERIMETER DRAINAGE OUTLET ELEVATION
7. INFILTRATION PIT SHOULD BE SITED OUTSIDE OF DRIP LINE OF NEARBY TREES



REV No.	DATE	BY	P.Eng.	REVISION DESCRIPTION

DRAWING TITLE: STORMWATER INFILTRATION PIT

PROJECT NAME: RENOOY RESIDENCE
955 BALMORAL ROAD, COMOX

LEGAL DESCRIPTION:

ENGINEER'S SEAL:

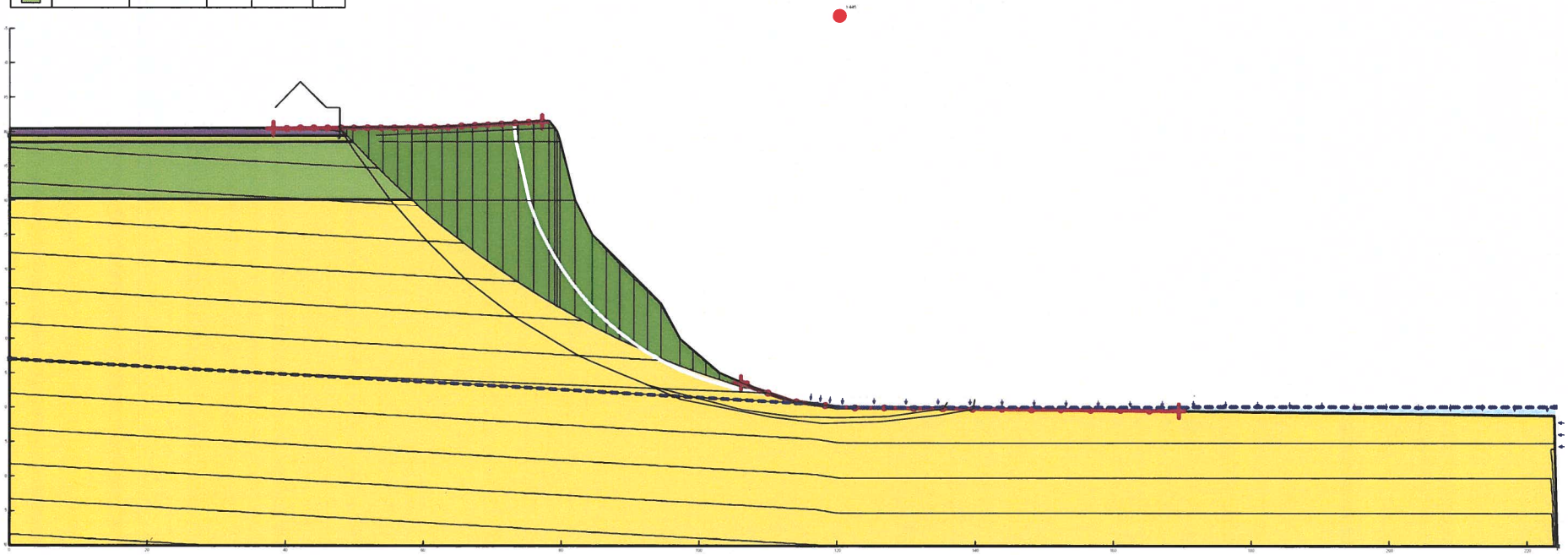
PLOT DATE	DRAWN BY
2018-03-28	JF
REVIEWED BY	SCALE
CMH	NTS
PROJECT No.	DRAWING No.
F5651	03

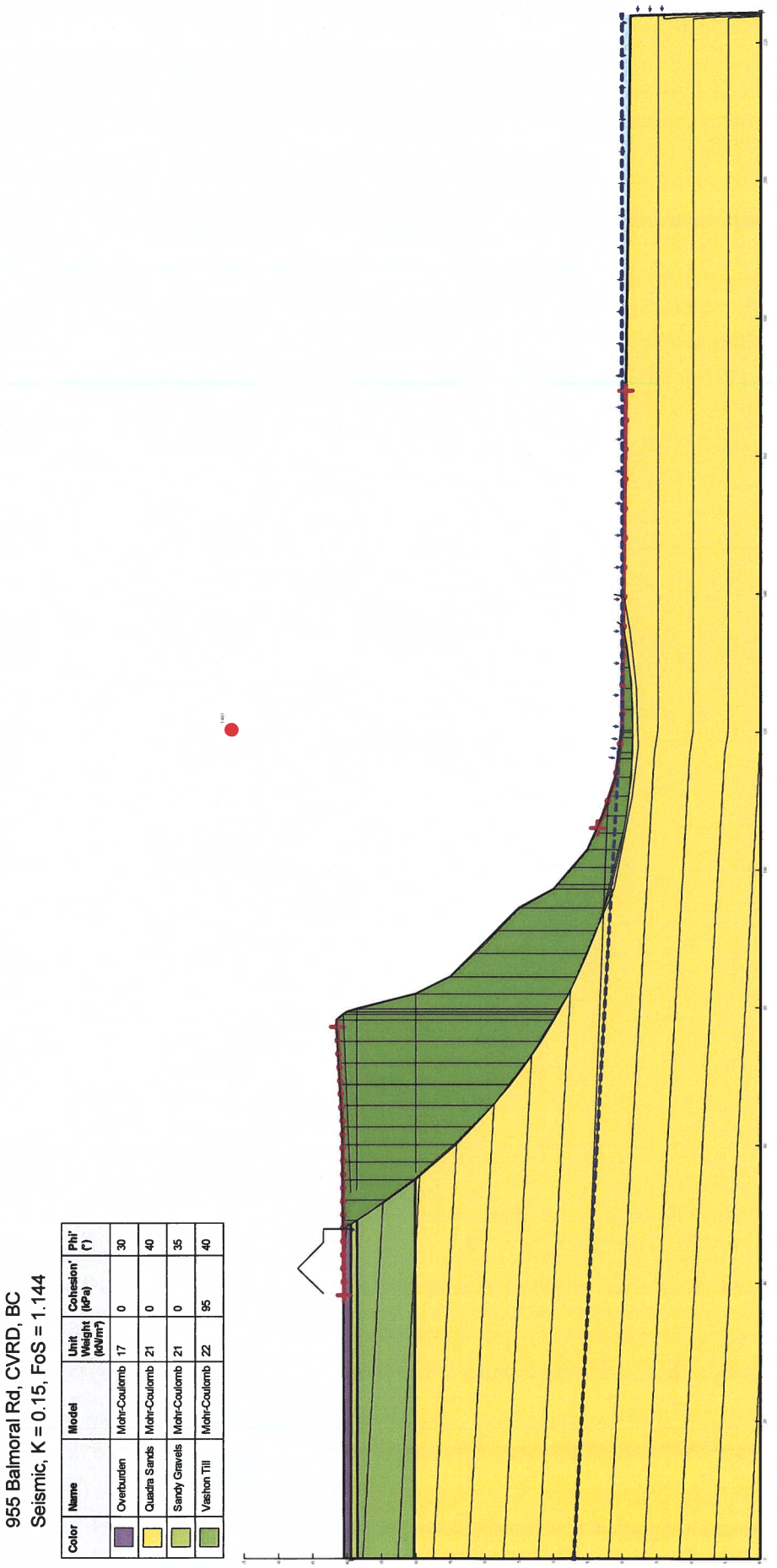
Lewkowich Engineering Associates Ltd.

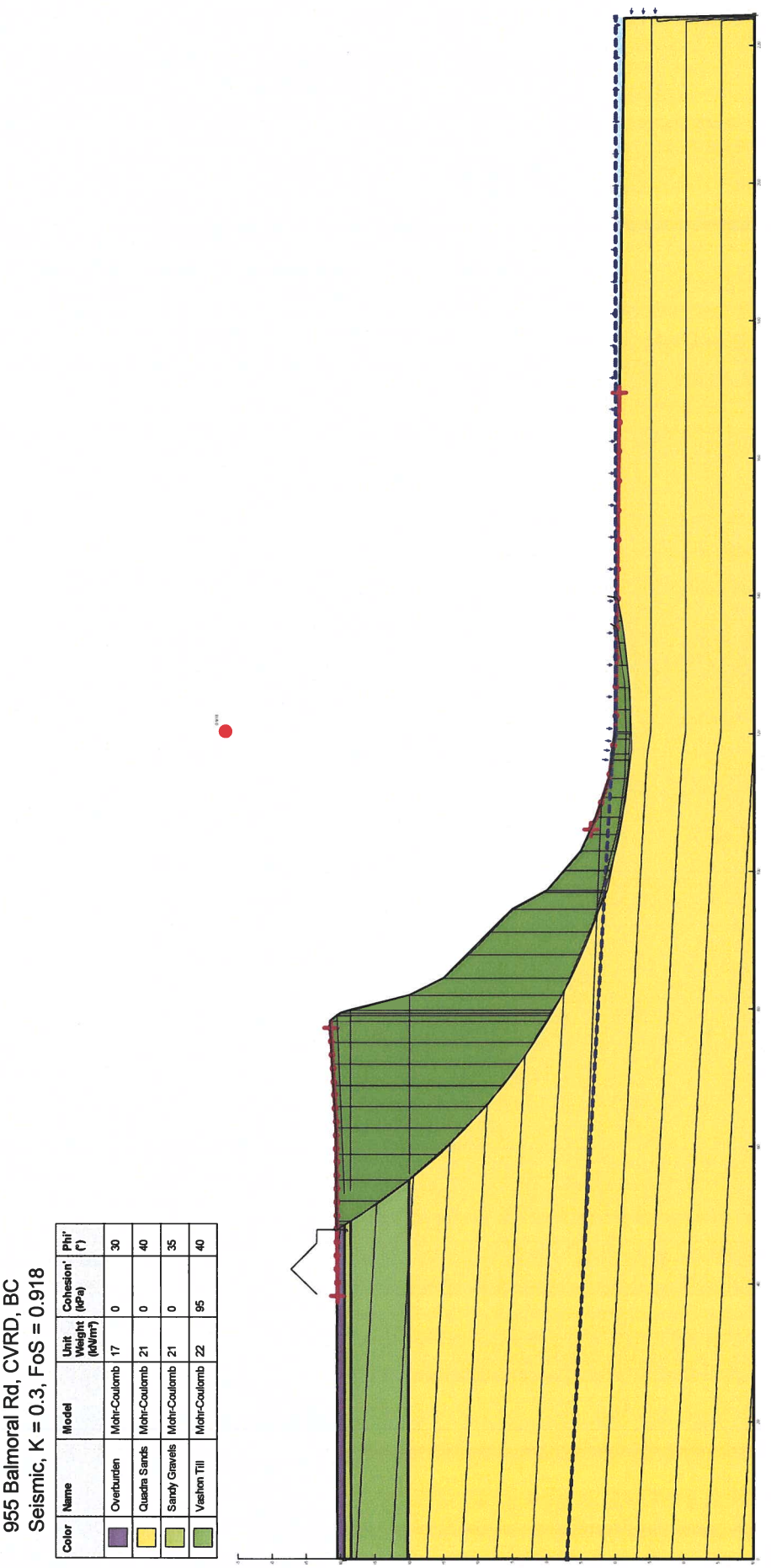
955 Balmoral Rd, CVRD, BC
Static

955 Balmoral Rd, CVRD, BC
Static, FoS = 1.445

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Overburden	Mohr-Coulomb	17	0	30
	Quadra Sands	Mohr-Coulomb	21	0	40
	Sandy Gravels	Mohr-Coulomb	21	0	35
	Vashon Till	Mohr-Coulomb	22	95	40




955 Balmoral Rd, CVRD, BC
Seismic, K = 0.15, FoS = 1.144
Color
Name
Model
Unit Weight (kN/m³)
Cohesion' (kPa)
Phi' (°)
Overburden
Mohr-Coulomb
17
0
30
Quadra Sands
Mohr-Coulomb
21
0
40
Sandy Gravels
Mohr-Coulomb
21
0
35
Vashon Till
Mohr-Coulomb
22
95
40


955 Balmoral Rd, CVRD, BC
Seismic, K = 0.3, FoS = 0.918
Color
Name
Model
Unit Weight (kN/m³)
Cohesion' (kPa)
Phi' (°)
Overburden
Mohr-Coulomb
17
0
30
Quadra Sands
Mohr-Coulomb
21
0
40
Sandy Gravels
Mohr-Coulomb
21
0
35
Vashon Till
Mohr-Coulomb
22
95
40

APPENDIX D: *LANDSLIDE ASSESSMENT ASSURANCE STATEMENT*

Note: This Statement is to be read and completed in conjunction with the "*APEGBC Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia*", March 2006/Revised September 2008 ("*APEGBC* Guidelines") and the "2006 BC Building Code (BCBC 2006)" and is to be provided for *landslide assessments* (not floods or flood controls) for the purposes of the Land Title Act, Community Charter or the Local Government Act. Italicized words are defined in the *APEGBC* Guidelines.

To: The *Approving Authority* Date: April 5, 2018

Comox Valley Regional District

600 Comox Road, Courtenay, BC V9N 3P6

Jurisdiction and address

With reference to (check one):

- ☐ Land Title Act (Section 86) – Subdivision Approval
- ☑ Local Government Act (Sections 919.1 and 920) – Development Permit
- ☐ Community Charter (Section 56) – Building Permit
- ☐ Local Government Act (Section 910) – Flood Plain Bylaw Variance
- ☐ Local Government Act (Section 910) – Flood Plain Bylaw Exemption
- ☐ British Columbia Building Code 2006 sentences 4.1.8.16 (8) and 9.4 4.4.(2) (Refer to BC Building and Safety Policy Branch Information Bulletin B10-01 issued January 18, 2010)

For the Property: Lot 1 Plan VIP4043 District Lot 140 Land District 15 Except Plan 16734
PID: 006-149-341 (955 BALMORAL ROAD, COMOX, BC) - LEA Project F5651

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a *Qualified Professional* and is a *Professional Engineer* or *Professional Geoscientist.*

I have signed, sealed and dated, and thereby certified, the attached *landslide assessment* report on the Property in accordance with the *APEGBC Guidelines*. That report must be read in conjunction with this Statement. In preparing that report I have:

Check to the left of applicable items

- ✓ 1. Collected and reviewed appropriate background information
- ✓ 2. Reviewed the proposed *residential development* on the Property
- ✓ 3. Conducted field work on and, if required, beyond the Property
- ✓ 4. Reported on the results of the field work on and, if required, beyond the Property
- ✓ 5. Considered any changed conditions on and, if required, beyond the Property
- 6. For a *landslide hazard analysis* or *landslide risk analysis* I have:
  - ✓ 6.1 reviewed and characterized, if appropriate, any *landslide* that may affect the Property
  - ✓ 6.2 estimated the *landslide hazard*
  - ✓ 6.3 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property
  - ✓ 6.4 estimated the potential *consequences* to those *elements at risk*
- 7. Where the *Approving Authority* has adopted a *level of landslide safety* I have:
  - ___ 7.1 compared the *level of landslide safety* adopted by the *Approving Authority* with the findings of my investigation
  - ___ 7.2 made a finding on the *level of landslide safety* on the Property based on the comparison
  - ___ 7.3 made recommendations to reduce *landslide hazards* and/or *landslide risks*

8. Where the *Approving Authority* has **not** adopted a *level of landslide safety* I have:

- /8.1 described the method of *landslide hazard analysis* or *landslide risk analysis* used
- /8.2 referred to an appropriate and identified provincial, national or international guideline for *level of landslide safety*
- /8.3 compared this guideline with the findings of my investigation
- /8.4 made a finding on the *level of landslide safety* on the Property based on the comparison
- /8.5 made recommendations to reduce *landslide hazards* and/or *landslide risks*

___9. Reported on the requirements for future inspections of the Property and recommended who should conduct those inspections.

Based on my comparison between

Check one

- ☐ the findings from the investigation and the adopted *level of landslide safety* (item 7.2 above)
- ☑ the appropriate and identified provincial, national or international guideline for *level of landslide safety* (item 8.4 above)

I hereby give my assurance that, based on the conditions[1] contained in the attached *landslide assessment* report,

Check one

☐ for subdivision approval, as required by the Land Title Act (Section 86), "that the land may be used safely for the use intended"

Check one

- ☐ with one or more recommended registered covenants.
- ☐ without any registered covenant.

☑ for a development permit, as required by the Local Government Act (Sections 919.1 and 920), my report will "assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the permit".

☑ for a building permit, as required by the Community Charter (Section 56), "the land may be used safely for the use intended"

Check one

- ☑ with one or more recommended registered covenants.
- ☐ without any registered covenant.

☐ for flood plain bylaw variance, as required by the "Flood Hazard Area Land Use Management Guidelines" associated with the Local Government Act (Section 910), "the development may occur safely".

☐ for flood plain bylaw exemption, as required by the Local Government Act (Section 910), "the land may be used safely for the use intended".

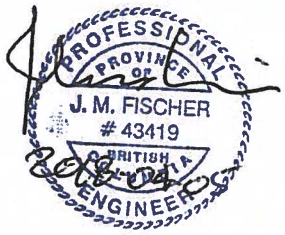
Johannes Fischer, P.Eng.
Name (print)

April 5, 2018
Date

Signature

[1] When seismic slope stability assessments are involved, *level of landslide safety* is considered to be a "life safety" criteria as described in the National Building Code of Canada (NBCC 2005), Commentary on Design for Seismic Effects in the User's Guide, Structural Commentaries, Part 4 of Division B. This states:

"The primary objective of seismic design is to provide an acceptable level of safety for building occupants and the general public as the building responds to strong ground motion; in other words, to minimize loss of life. This implies that, although there will likely be extensive structural and non-structural damage, during the DGM (design ground motion), there is a reasonable degree of confidence that the building will not collapse nor will its attachments break off and fall on people near the building. This performance level is termed 'extensive damage' because, although the structure may be heavily damaged and may have lost a substantial amount of its initial strength and stiffness, it retains some margin of resistance against collapse".



(Affix Professional seal here)

2351B Rosewall Crescent, Courtenay, BC

Address

V9N 8R9

250 334 0384

Telephone

If the *Qualified Professional* is a member of a firm, complete the following.

I am a member of the firm Lewkowich Engineering Associates Ltd.
and I sign this letter on behalf of the firm. (Print name of firm)

Brianne Labute

From: Danika Wong <dwong@currentenv.ca>
Sent: Monday, July 23, 2018 10:44 AM
To: Brianne Labute
Subject: Fwd: Work outside window

Hi Brianne,

Here is the communication from DFO. I indicated to Bruce Renooy that we are confident we can proceed without harm to fish. Other than the timing window, our works meet DFO requirements for works that do not require a review. Given the proximity to the end of the work window, that timing is not a concern, and we will still be completing our forage fish surveys in advance of work and monitoring any potential impacts.

Thanks!

---------- Forwarded message ----------
From: **Wright, Marina** <Marina.Wright@dfo-mpo.gc.ca>
Date: 19 July 2018 at 08:54
Subject: RE: Work outside window
To: Danika Wong <dwong@currentenv.ca>

Hello Danika,

Thank you for your questions. I have provided our standard advice below. I hope that it provides you with some clarity. Unfortunately a Request for Review is the only mechanism to receive advice from DFO on projects that are considered unlikely to require a *Fisheries Act* authorization.

I don't mind receiving questions, however the best avenue for these types of inquiries is through the Triage & Planning Unit:

Triage & Planning Unit
Fisheries Protection Program
Ecosystem Management Branch
Fisheries and Oceans Canada
200 - 401 Burrard Street
Vancouver, British Columbia V6C 3S4
Telephone: Toll free 1-866-845-6776
Email: ReferralsPacific@dfo-mpo.gc.ca

Least Risk Timing Window:

I understand project work may occur outside of the recommended low risk timing window for the project area, http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/bc-s-eng.html.

Please note that the low risk timing window for marine work is a guideline that DFO recommends to reduce the risk of causing harm to fish and fish habitat during foreshore or in water work. This does not prevent you from proceeding with your work outside of this time period; however, you should be aware that the likelihood of encountering fish during sensitive life stages is higher outside of the window of least risk. It is the Proponent's responsibility to ensure that works do not contravene the *Fisheries Act* prohibitions against serious harm to fish (section 35).

Request to review project info without a review by DFO:

If you are uncertain as to whether the proposed work, undertaking or activity will result in serious harm to fish, I suggest submitting a Request for Review to ReferralsPacific@dfo-mpo.gc.ca. Please refer to our Projects Near Water website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) for advice and information to self-assess the proposed project element or prepare a submission to DFO, as appropriate.

Please note that it remains your responsibility to avoid causing serious harm to fish in compliance with the *Fisheries Act*, and avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in compliance with the Species at Risk Act. If you have caused, or are about to cause, serious harm to fish that are part of or that support a commercial, recreational or Aboriginal fishery without authorization, you have a duty to notify DFO, in accordance with subsection 38(4) of the *Fisheries Act*, by contacting us through the Observe, Record, Report line (toll free) at 1-800-465-4336; or in Greater Vancouver at 604-607-4186.

I hope you have a good day,

Marina

Marina Wright

Fisheries Protection Biologist | Biologiste de la protection des pêches,

Fisheries and Oceans Canada| Pêches et Océans Canada

3190 Hammond Bay Road, Nanaimo, BC, V9T 6N7

Office: 250-756-7247

Email: marina.wright@dfo-mpo.gc.ca

From: Danika Wong [mailto:dwong@currentenv.ca]
Sent: July-18-18 7:45 AM
To: Wright, Marina
Subject: Work outside window

Hi Marina,

I have a question about working outside the summer work window in Comox for a project not requiring a Request for Review - if you are not the correct person to ask, please let me know and point me in the right direction if possible!

We did a biophysical report for a client repairing rip rap along Balmoral Road (bluffs north of Goose Spit) originally installed by CVRD. We did the self assessment, and opted not to submit an RFR as all his repairs are on private property landward of HWM. CVRD has indicated they won't be able to issue his development permit until September, but said they will permit him to work between September and October if we have permission from DFO to work outside the window by a few weeks. As we did not submit a RFR, I'm not sure if there is any mechanism to seek approval for this that will satisfy the CVRD. Are you able to speak to that at all?

Thanks!

--

Danika Wong

558 England Avenue

Courtenay, BC V9N 2N3

(250)871-1944

currentenvironmental.ca

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Danika Wong

Current Environmental Ltd.
558 England Avenue
Courtenay, BC V9N 2N3
(250)871-1944
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