



AQUAPARIAN

Environmental Consulting Ltd.



February 15, 2023



Via Email: [Redacted]

**RE: Environmental Assessment for New Retaining Wall
62 Gordon Road, Cowichan Lake, Cowichan River**

1.0 INTRODUCTION

Aquaparian Environmental Consulting Ltd (Aquaparian) was retained by you to complete an environmental assessment for the re-construction of a concrete retaining wall for the property at 62 Gordon Road in the community of Cowichan Lake, BC. The property is located on the north side of the Cowichan River and backs onto the river. The subject property is further located approximately 970m downstream of the dam / weir and 170m downstream of the vehicle bridge crossing on South Shore Road in Cowichan Lake. Aquaparian understands you recently purchased the property and that a backyard retaining wall on the top of bank (TOB) with the Cowichan River is in a state of rapid decay resulting in the erosion of its footing, sloughing of the bank and the destabilizing of the southeast foundation corner of the home on the property. Soil erosion and settling has resulted in cracking of a window pane and the worry that further erosion over the coming winter may result in further damage to the wall and residents. Because the location of the house and old retaining wall were constructed more than 40 years ago and because present day municipal bylaws and development regulations identified much of the property to now be within a watercourse Development Permit Area's (DPA) as per the communities Official Community Plan (OCP), repair works to the retaining wall will likely require the complete of a Development Permit application and Environmental Impact Assessment (EA). It is also expected that the works within or near the river will require completion of a Provincial Section 11 Notification / Approval as per the Water Sustainability Act (WSA) and potentially the completion of a Riparian Area Protection Regulation (RAPR) assessment. This EA report is a requirement for a Development Permit and a requirement to determine whether the retaining wall repair or replacement works could result in an impact to fish or fish habitat.

Properties on the Cowichan River are associated with several Municipal Development Permit Area (DPA) requirements as identified in the Official Community Plan (OCP) including a Riparian DPA; Floodplain DPA, and a Sensitive Ecosystem DPA.

The property at 62 Gordon Road (Lot 17) is approximately 0.07 ha in size, zoned Residential R1 and located within the Town of Cowichan Lake. A google earth site location map is included as Figure 1a & 1b while a OCP Mapping image from the Town of Cowichan Lake is included as Figure 2. Site photographs of the retaining wall and subject property taken in March 2022 and October 2022 have been included in this report as Appendix A. The property includes a small single-family resident and a wood structured garage.

2.0 APPLICABLE REGULATIONS

The following is a review of federal and provincial *Acts* and *Regulations* that may apply to this project. If any *Act* or *Regulation* is amended prior to construction, the work is to be carried out in accordance with the amended *Acts* and *Regulations*.

Federal *Fisheries Act* Section 35: On August 28, 2019, fish and fish habitat protection provisions under the new *Fisheries Act*, as well as some of the regulations that support these provisions, officially came into force. The new prohibitions include the following:

- No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish; and,
- No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat. The definition of harmful alteration, disruption or destruction of fish habitat is any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish.

Federal *Fisheries Act* Section 36: Environment and Climate Change Canada administers Section 36 of the *Fisheries Act*, the key pollution prevention provision, prohibiting the deposit of deleterious substances into waters frequented by fish, unless authorized by regulations under the *Fisheries Act* or other federal legislation. A deleterious substance can be any substance that, if added to any water, would degrade or alter its quality such that it could be harmful to fish, fish habitat or the use of fish by people.

Provincial *Water Sustainability Act*. Works in and about a stream under Section 11 of the *Water Sustainability Act* requires that a person may only make "changes in and about a stream" under an Approval or Notification. "Changes in and about a stream" means: *any modification to the nature of the stream including the land, vegetation, natural environment or flow of water within the stream, or any activity or construction within the stream channel that has or may have an impact on a stream.* As understood, a Section 11 Notification has been obtained for this project. Keep the Notification letter on site during the construction phase of the project.



Species-at-Risk Act. The *Act* is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity.

Federal Migratory Birds Convention Act, 1994. Most species of birds in Canada are protected under this act. “Migratory birds” are defined by Article I of the Convention which names the families and sub-families of birds protected, and provides some clarification of the species included. In general, birds not falling under federal jurisdiction within Canada include grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, kingfishers, and some species of blackbirds. The project is being completed outside the nesting season of migratory birds.

Section 34 of the Provincial Wildlife Act, states that a person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys:

- (a) a bird or its egg,
- (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or
- (c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg. The project is being completed outside the bird nesting season.

Heritage Conservation Act. All archaeological sites, recorded or not, are protected under the *Heritage Conservation Act* and must not be altered or damaged without a site alteration permit from the Archaeology Branch.

3.0 SITE DESCRIPTION

Aquaparian completed two site visits of the subject property, first in March 25, 2022 during a period of high river flows and after the owners had recently purchased it, and recently on October 24th, 2022 when rivers flows were at a seasonal low. The retaining wall extends the width of the backyard over a length of 24m, is partially angled within the eastern half of the yard and constructed as a pre-fabricated poured-in-place concrete wall approximately 20cm thick and approximately 1.2 to 1.6m in height (from its foundation). While the toe of the wall is embedded in the bank about 1m behind and above the rivers average high-water mark, the angled sections of retain wall (east side) show signs of cracking and separation. Portions of the bank also show some undermining. A strip of grassed yard is located between the foundation of the house and the retaining wall ranging from 1 to 2.5m in width and shows some evidence of



sloughing at the corner of the sunroom. The owner expects to partially remove a section of the sunroom in order for installation of a new retaining wall.

It appears the previous owner had used airline cable and chain as a means to partially anchor slumping sections of the wall from falling over. Sections of the retaining wall (East side) show signs of erosion at its toe and where round river rock has been placed to further protect the toe. It is understood that the large rain event that occurred during November 2021 swelled the river to a height where it breached the toe of the wall impacted the southeast corner of the house. The section of yard facing the river also includes a poured concrete sidewalk that shows cracking. A wooden deck is also connected / keyed into the retaining wall and leads to a wooden gangway and wood dock/float on the river. The wood deck is positioned in the middle of the retaining wall. A 1.0 to 1.5 section of bank extends out from the retain wall and down to the waters edge. The bank is fully vegetated and consists of a 2.5 to 3.0m thick hedgerow dominated by hardhack, English ivy and Himalayan blackberry. The east corner of the property also includes rhododendron and a Pacific Crab apple, while the west side of the retain wall area includes a dense mix of ivy and blackberry (See Appendix A).

A site visit in October 2022 confirmed the waters edge also includes emergent (Aquatic) patches of yellow iris, cattail, and some terrestrial grasses and submergent aquatic plants dominated by Eurasian Watermilfoil and smartweed. The section of river on the east side of the property and dock was much deeper than along the west side of the property and dock. Due to low water conditions, one could visually see that the bottom became much shallower (formed by a sand wedge) as the shoreline turned into a small embayment. The bottom was mud and did include a thick mat of milfoil as it shallowed towards the west side of the dock.

3.1 Fisheries Resource

Lake Cowichan and Cowichan River are understood to support at least 13 fish species including Pacific salmon, trout and several other coarse freshwater fish. A summary of fish presence within the lake and river system using provincial database Habitat Wizard include coho salmon, sockeye salmon, chinook salmon, Atlantic salmon (invasive), rainbow trout, dolly varden trout, brook trout (introduced), brown trout (introduced), Western brook lamprey, small mouth bass (introduced) brown bull head catfish (introduced) and Western pearl mussel. The section of river bottom fronting the retaining wall of the subject property was found absent of gravels or cobbles suitable for salmonid spawning. While the section of river fronting the property provides no spawning habitat for cold water fish species, it does provide foraging habitat for a variety of fish. Dense hard hack during high water flow likely provides foraging cover for bass and various trout species. The section of river fronting of property is connected to the downstream outlet to Lake Cowichan. Fisheries timing window for the Cowichan River is



4.0 PROPOSED RETAINING WALL IMPROVEMENTS

Design improvements to the subject properties retaining wall is provided by Ryzuk Geotechnical Engineers (Ryzuk) of Victoria BC (See Appendix B). Ryzuk proposed to construct a stacked Verti-block retaining wall as a replacement for the existing wall. The works will include removing the old retaining wall during the summer (August – September) when the Cowichan River is at its lowest and installing a precast Verti-block wall. The Verti-wall blocks have a hollow core and will be filled with 19mm minus crushed rock. Most of the existing retaining wall appears to “not” have been properly trenched in place and only install with a shallow excavation. The new retaining wall will be located immediately in front of the existing wall but along the top of bank and above the rivers high water mark (HWM). The new wall will span the width of the property and include excavating a foundation trench 1.0 to 1.5m deep, a gravel foundation pad and then stacking Verti-blocks 3-high, followed by drainage pipe (100mm perforated PVC pipe) and backfilling with gravel. The wall is expected to be at least 50cm above the height of the HWM (See Appendix B). Again, the owners are partially removing a sunroom to allow for the excavation of the foundation trench for the wall. The design will not have any influence of fish habitat and only result in short-term impacts to shoreline dominated by invasive plants. Native vegetation is expected to re-establish itself within one year.

5.0 ENVIRONMENTAL CONCERNS

Aquaparian understands protection of the environment during the construction works is a focus for this project. As per the project location, environmental concerns are expected to be limited to the following:

- Short-term loss of fish habitat from vegetation clearing during retaining wall repair or replacement works;
- Potential release of sediments to fish bearing waters from ground clearing, excavations for the retaining wall;
- The potential for deleterious substances (hydrocarbons, hydraulic oil, uncured concrete, etc) to enter freshwater environment during construction; and,
- The potential for accidents and malfunctions during all construction works including equipment failure resulting in spills.



It is understood that repairs or re-construction of the retaining wall adjacent to the Cowichan River is expected to include the clearing of native riparian vegetation, the excavations of soils, grading, concrete foundation works, and importing of gravels. Post-construction restoration is expected to include replanting and re-seeding of disturbed vegetation areas. As such, environmental concerns associated with this project during deconstruction and construction activities have the potential to result in some negative impacts to freshwater fish habitat primarily in association with vegetation clearing and water quality. As part of the approval and permit stage for the project, the project is expected to require the following:

- Completion of a Development Permit application for DPA 1 – Riparian / Watercourse and Streamside Protection and for DPA 2 – Floodplain / Natural Hazard Lands.
- The completion of a BC provincial Section 11 Water Sustainability Act (WSA) Change Approval submission for Changes in and about a Stream.
- Completion of an Environmental Protection Plan that outlines all environmental protection measures to be implemented during repair or replacement works to the retaining wall.

In general, all retaining wall construction works should be completed as follows:

- Earthworks should be completed during the dry season and during low stream flows for the Cowichan River to prevent sediment migration into the river. As understood, the project is to be completed within the “Least Risk” instream work window for fish and occurring between June 15 to September 15. It is understood that low river flows likely occur between **August 1 to September 15** of a given year. Retaining wall repair works should be focused within this time period is possible.

This project is not expected to require a Riparian Habitat Assessment due the fact that the works are associated with repairs to an existing retaining wall.

6.0 ENVIRONMENTAL PROTECTION MEASURES

The purpose of the following Environmental Protection Measures is to work with the Contractor(s) to ensure environmental compliance as per the *Fisheries Act* and to follow the terms and conditions, regulatory permits and approvals for the project. The following sections outline various protection measures to address during construction.

General Environmental Protection Measures	Section 6.1
Spill Prevention & Waste Management	Section 6.2



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Spill Management Plan	Section 6.3
Spill Reporting Procedure	Section 6.4
Sediment Control	Section 6.5
Concrete Management	Section 6.6
Vegetation Clearing Management	Section 6.7
Fish & Fish Habitat	Section 6.8
Wildlife Impact Management	Section 6.9

6.1 General Environmental Protection Measures

The Contractor is responsible for implementing the following environmental protection measures:

- Have an understanding of all aspects of the Project including the contract documents, project-related authorizations, agency permits, a copy of this CEMP and other documents be completed prior to the start of construction and that hard copies of each required document be on-site;
- That portions of retaining wall re-construction works will require an environmental monitor (EM) on site;
- That vegetation clearing be completed outside the migratory bird nesting window which is regionally recognized between March 15 to August 15, or to have the EM complete a bird nest survey to confirm the presence of any bird nesting activity;
- All construction work will be conducted in a manner that does not result in the deposit of a toxic or deleterious substance or construction waste within the riparian or aquatic habitats;
- Record and document environmental incidents should they occur (i.e., accidental spills) as well as spill response / clean-up measures, and impacts to fish and wildlife;
- Inform the EM for the project immediately if any fuel, oil and chemical spills that occur on land or in the water;
- Perform daily equipment inspections and monitoring of on-site machinery for oil leaks and follow-up any repairs prior to machinery being mobilized on site;

- That the construction contractor to have a spill prevention kits on site to rapidly address any potential fuel or hydraulic oil spills that could occur on site;
- Ensure all heavy equipment (i.e. motors or generators) have appropriate noise suppression devices (i.e. mufflers) to reduce noise for wildlife and any surrounding residential homes. All construction activities are to comply with WorkSafe BC Occupational Health and Safety noise regulations and municipal bylaws for noise.

6.2 SPILL PREVENTION & WASTE MANAGEMENT

- The Contractor is to perform daily inspection and verification that all heavy equipment is in good working order, clean and free of leaks prior to mobilizing on site;
- All machinery will have spill kits on board;
- The Contractor to have a designated location for storing all fuels, chemicals, general garbage and hazardous waste material prior to the start of works for this project. The Contractor is to retain a “licensed company” specializing in the handling of hazardous waste for collecting and processing hazardous waste generated from the project;
- Storage of deleterious substances such as fuel, oil, concrete mix to be stored and located more than 15m away from the shoreline of the river at all times. Small Gerry fuel cans are to be placed in rubber-made tubs as containment and also stored at least 15m from the shoreline. Check all hydraulic hoses, fuel hoses and connections when using tidy tank for regular wear. No fueling of any equipment (i.e. heavy equipment, saws, generators) within 15m of the river;
- Wrap hose connections with sorbent material to catch any leaks and drips during fuel/oil transfer. Spill containment trays are to be used during all oil transfers and greasing. Any fuel, oil or grease spills are to be cleaned up immediately and cleaning material and contaminated surface soils disposed of into a marked hazardous waste containment bin;
- Hazardous waste material generated in the course of the project (oil absorbent pads, oily & grease covered rags, grease tubes, containers, etc.) shall be disposed of in compliance with regulations. Hazardous waste material shall be stored in closed waste disposal containers that are clearly labelled according to the *Transportation of Dangerous Goods Act* regulations. The Contractor is to clearly identify the hazardous waste containment area prior to start of project works;

- Appropriate spill control equipment (spill kits) will be kept on site during the work. Operating personnel are to be familiar with the contents and use of the spill response equipment and the location and operation of emergency 'shut-offs' of equipment. The Contractor is to administer training for all site personnel on spill prevention measures, spill response and the locations of spill kits;
- Inspect all temporary and permanent fuel storage tanks / Gerry cans to ensure there are no potential leaks prior to, during and after filling;
- If a fuel or hydraulic oil spill occurs, the operator of the machine shall stop work immediately, address the immediate containment and clean-up of the spill and undertake the repair or replacement of the machinery before work is allowed to continue. **All spills are to be documented and reported to the EM.**

6.3 SPILL MANAGEMENT PLAN

- The Contractor is to have Spill Prevention and Emergency Response Plan in place prior to the start of works. The plans shall be communicated to all field crews at the pre-work orientation meeting and at regular intervals thereafter and will be strictly enforced;
- Spill kits are to be located near chemical and fuel storage, as well as in the site office and on all heavy equipment. Contractor site personnel are to be familiar with the use of spill kits;
- Containment, recovery and clean-up procedures are to be in place and all site personnel are to be trained by the Contractor;
- Monitoring of vehicles and equipment for leaks (fuel, lubricants) or worn lines should be conducted by the Contractor on a daily basis;
- All heavy machinery should be equipped with environmentally-sensitive hydraulic fluids that are non-toxic to aquatic life and are biodegradable;
- Ensure all fueling occurs on a flat, impermeable surface with funnels, spill pads and drip trays in place or immediately available; not closer than 15m away from river;

- Project emergency contact list is to be provided to the Contractor prior to the start of the work; and,
- Spill kit contents shall be consistent with requirements outlined in Table 9.3 of A Field Guide to Fuel Handling, Transportation and Storage (MWLAP and MoFR 2002).

Emergency Spill Response Kit Contents:

No. Description Stock Numbers

- Spill Response Kit (Complete kit) 154-0017
- 2 each 10' Oil Only Socks 154-0018
- 15 each Polypropylene Sorbent Pads (Oil Only) 18" x 18" x 3/8" 154-0019
- 1 each Neoprene Mat (Drain Cover) 48" x 48" x 1/8" 154-0804
- 1 each PCB Test Kit - 154-0016
- 1 each 250 ml Glass Sampling Jar with Lid and Eye Dropper 154-0816
- 1 each 25 ml Amber Bottle with Lid - (Not Required) 154-0829
- 2 each Sample Jar Labels and Chain of Custody Doc. Stores 1
- 2 each 10 Quart Cellulose Sorbent Material, Oil Only 154-0020
- 1 each Barrier Ribbon, Yellow "Caution Do Not Enter" 154-0805
- 1 each Poly Disposal Bags (45 gal. drum size, minimum 6 mil) 113-0015
- 1 each Blank Labels for Plastic Bags Stores 1
- 1 each Plastic Bag Tie 388-4072
- 1 each Epoxy Plug Compound (Hydrocarbon Compatible) 154-0021
- 1 each Spill Kit Container Marked "Spill Response Kit" 154-0835
- 1 each Spill Response Card Print Shop D98-19
- 1 each List of Kit Contents Print Shop D98-7

** IMMEDIATE REPLACEMENT OF ANY CONTENTS USED IS ESSENTIAL **

Spill Response Procedure:

- 1. MAKE THE AREA SAFE**
- 2. STOP THE FLOW (when possible)**
- 3. REPORTING**
- 4. SECURE THE AREA**
- 5. CONTAIN THE SPILL**
- 6. NOTIFY/REPORT**
- 7. CLEAN-UP**



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8. SPILL REPORT

1. MAKE THE AREA SAFE

- Evaluate risk to Personal/Public and Environmental Safety;
- Wear appropriate Personal Protective Equipment (PPE);
- Never rush in, always determine the product spilled before taking action;
- Warn people in the immediate vicinity; and,
- Ensure no ignition sources if spill is a flammable material.

2. STOP THE FLOW (when possible and safe to do so)

- Act quickly to reduce the risk of environmental impacts;
- Close valves, shut off pumps or plug holes/leaks; and,
- Stop the flow or the spill at its source.

3. REPORTING

- Verbally notify Town of Lake Cowichan of incident (provide spill details).

4. SECURE THE AREA

- Limit access to the spill area; and,
- Prevent unauthorised entry onto the site.

5. CONTAIN THE SPILL

- Block off and protect drains and culverts;
- Prevent spilled material from entering drainage structures (ditches, culverts, drains);
- Use spill sorbent material or containment boom to contain the spill;
- If necessary, use a dyke or any other method to prevent any discharge on site; and,
- Make every effort to minimize contamination.

6. NOTIFICATION

- Report all spills to the Town of Lake Cowichan and EM immediately. Contact EMBC if a spill cannot be contained and cleaned up and second level response is required. All spills to water are to be reported to the EMBC.

7. CLEAN-UP

- Determine required cleanup options;
- Mobilize recovery equipment and cleanup crew and direct cleanup activities;
- Dispose of all equipment and/or material used in clean up (e.g., used sorbent, oil containment materials, etc.) in accordance with MFLNRO requirements;



- Accidental spills may produce hazardous wastes (e.g., material with > 3% oil by mass) and contaminated soil. All waste disposals must comply with the *Environmental Management Act* and Regulations; and
- Replenish spill response kits and equipment.

8. SPILL REPORT

- Provide necessary spill details. The following information should be submitted to the Project Representative within one day of a spill incident:
 1. Date and time of spill (incidence occurrence, discovery, and clean-up commencement)
 2. Type of material spilled and Transport of Dangerous Goods classification
 3. Spill surface (gravel, water, pavement, shop floor)
 4. Quantity of material spilled and quantity recovered (kg/L)
 5. Source/origin of spill
 6. Cause of spill (description of incident)
 7. Corrective action taken and action plan to prevent a subsequent spill
 8. Human impacts
 9. Environmental impacts (ground, water, vegetation, wildlife)
 10. Weather conditions at the time of the incident
 11. Agencies or authorities notified or involved
 12. Media interest
 13. Additional comments.

6.4 SPILL REPORTING PROCEDURES

Spill prevention and emergency response procedures shall be communicated to all field crews at the start of the project and thereafter at regular intervals throughout the contract. An environmental incident is one that has caused, or has the potential to cause, one or more of the following:

- Environmental damage;
- Adverse effects to fish, wildlife or other environmental resources;
- Adverse publicity with respect to the environment; and
- Legal action with respect to violation of statutes or environmental damage.

Examples of an environmental incident include, but are not limited to:

- Spills of oil, hydraulic fluid or other hazardous chemicals; and,
- Discharges of deleterious substances into the marine environment.



6.5 SEDIMENT CONTROL MEASURES

- Earthworks near the watercourse will be scheduled to avoid periods of heavy precipitation. Retain wall replacement works to be done between August 1 to September 15 during dry summer months and periods of low river flows;
- All sediment control measures will be in place (i.e. silt fencing) prior to and during construction and then removed only after the site is deemed stable;
- The Contractor to install silt fencing along the toe of the construction zone (above the present natural boundary of Cowichan River) prior to vegetation clearing or earthworks. Ensure silt fencing is properly anchored into the ground;
- All spoil piles are to be located at a minimum of 15 metres back from the watercourse. Spoil piles left over long periods of time to be covered with poly-plastic sheeting (6 to 10mil poly) or encircled with silt control fencing trenched in place;
- Erosion and sediment controls are to be inspected and maintained by the Contractor on a daily basis;
- The Contractor is responsible for storing and maintaining erosion and sediment control contingency supplies onsite. The contingency supplies (i.e. silt fencing, poly sheeting, tarps, straw bales) must be readily accessible, clearly identifiable, and of sufficient quantity to respond to an event;
- All fill material imported to the site must be free of silt, overburden or debris or other substances deleterious to aquatic life;
- The Contractor is to inspect environmental mitigation and protection measures to assess whether they are functioning as desired, document work activities and implementation of mitigation measures;
- Water quality (turbidity) will be monitored as needed during excavations, import of rock fill materials and concrete pours. Water sampling requirements to be determined by EM for project;
- The following water quality guidelines for turbidity apply to the Project where

“background” is defined as the level at an appropriate adjacent reference site that is neither affected by works at the site, nor by sediment-laden, induced suspended sediments, or induced turbidity resulting from works or activities with the Project of work site:

BC Water Quality Guidelines for Aquatic Life (BCQG) are as follows:

- Change from background of 8NTU at any one time for a duration of 24hr during clear waters;
- Change from background of 2NTU at any one time for a duration of 30 days during clear waters;
- Change from background of 5NTU at any time when background is 8-50NTU during turbid water;
- Change from background of 10% when background is >50NTU at any time during turbid water;

(Table 1: Summary of water quality guidelines for turbidity, suspended and benthic sediments. For complete details (including definitions for background, clear flow, and turbid flow) see Caux et al. (1997) (<http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbiditytech.pdf>)

- Should the NTU levels in excess of the criteria outlined above, then those works and activities that might be contributing to these conditions must be halted until measures that will ensure compliance with the criteria outlined above are put in place.

6.6 CONCRETE MANAGEMENT

- No uncured concrete, grout or concrete pour water is to enter the aquatic environment. High pH caused by uncured concrete is harmful to fish. Manage concrete pours (i.e. foundation works) to prevent spillage. pH is to be monitored in the event of a spill. pH is to be between 6.5 – 9.0 pH units with a turbidity of <25 NTU, and the turbidity is less than 25 NTU measured to an accuracy of +/- 2NTU; and,
- No concrete, grout equipment / tools, or concrete delivery chutes are to be washed down near the watercourse. If necessary, a waste water pump truck should be brought on site to capture concrete laden waste water during concrete foundation works. The concrete waste water should be taken back to the concrete facility for disposal. No waste concrete is to be discarded outside the construction footprint.

6.7 VEGETATION MANAGEMENT

- Minimize vegetation removal for the retaining wall project as much as possible. Prior to the start of vegetation removal, the clearing area is to be fully demarcated by visible flagging;
- Trees or ground vegetation to be retained are to be protected from damage as much as possible. Install plastic snow-fencing around the drip line of trees adjacent to the vegetation clearing area to prevent damage and compaction of root systems from heavy equipment;
- All disturbed areas of bare soil are to be re-seeded with a native seed mix as soon as possible post-construction and covered with a layer of straw to prevent erosion;
- Design or re-instated retaining wall may require live planting of vegetation as a measure of compensation for loss / clearing of riparian vegetation. Replacement vegetation can include live staking of native semi-aquatic shrubs;
- A planting plan for the top of the retaining wall is to be provided for this project (as required) at a later date.

6.8 FISH & FISH HABITAT

- Construction works should be completed in the Least Risk fish window for the area (June 15 - September 15) or at the discretion of a Registered Professional Biologist. This is also during the lowest flow period of the river;
- EM to monitor water quality (i.e. turbidity) in the Cowichan River during clearing, excavation, concrete pouring and any replanting works;
- Heavy equipment is to be clean and free of leaks prior to arriving on site. Spill kits are to be on site. No refuelling is to take place within 15m of the watercourse;
- All heavy equipment (i.e. excavators) to be equipped with a non-petroleum based mineral hydraulic oil which is non-toxic and biodegradable (i.e. Chevron Brand “Clarity” product or equivalent). The project “Environmental Monitor” will check to confirm compliance at the project start-up meeting;
- Sediment laden spoils shall be stockpiled in such a way that sediment laden water does not enter into the watercourse. Use silt fencing / filter cloth in a semicircle to impound

the spoil piles to filter pour water and contain sediments or completely cover spoils with poly-plastic sheeting if left for long periods of time. Sheeting to be anchored;

- All disturbed soils are to be protected from erosion immediately upon completion of works. Straw cover and grass seed are to be spread over disturbed soils;
- All fill brought to the site is to be clean i.e. free of clay fines, heavy silts and hazardous contaminants;
- No fuel, oil or other lubricants are to be stored within 15m of a water course; All fuel Gerry cans should be placed in containment bins (i.e. rubbermaid tubs) to prevent spills or drips.
- If the construction is delayed or extended into the fall rainy season, or in an unexpected rise in the river level occurs such that the retaining wall work area becomes inundated, all works to stop and works to be re-scheduled until low river flow conditions return. No works to occur during heavy rainfall.

6.9 WILDLIFE IMPACT MANAGEMENT

- Clearing of trees and ground vegetation will occur outside the bird nesting period from March 1st to August 15th; and,
- Food waste on site is to be stored in a labelled garbage container with a lid or in a site trailer and removed regularly to prevent attraction by wildlife.

7.0 CLOSURE

Aquaparian Environmental Consulting Ltd (Aquaparian) was retained by Matt Scutt to complete an environmental assessment for the re-construction of a concrete retaining wall for his property at 62 Gordon Road which backs onto the Cowichan River. The new retaining wall will be located immediately in front of the old existing wall above the bank and above the rivers high water mark (HWM). The new retaining wall will span the width of the property and include excavating a foundation for the stacked block retaining wall and backfilling with gravel. While the project will require the removal of primarily invasive ivy and blackberry, the project is not expected to result in any impact to fish or natural fish habitat. No in-water works are expected for this project.



All relevant environmental factors were considered in the preparation of this report including impacts to fish and wildlife, as well, any direct residual effects and cumulative effects. Based on the assessment, it is Aquaparian's professional judgement that no negative or adverse impacts to fish, fish habitat is expected to occur from this project. Aquaparian will be available to provide Environmental Monitoring Services during installation of the new retaining wall for this project. Findings and recommendations provided in this report are based on known site conditions and past project experience with working in and near freshwater environments and in accordance with generally accepted practices within the profession of biology and natural resource management. No other warranty is made, either expressed or implied.

Aquaparian trusts that the information provided in this report meets your requirements. Any questions regarding information provided in this document, please contact the undersigned at (250) 591-2258.

Regards,

AQUAPARIAN ENVIRONMENTAL CONSULTING LTD

Prepared by:



Chris Zamora B.Sc., R.P.Bio
Senior Biologist/Principal



\\AQUAPARIAN-NAS\DOCUMENTS\PROJECTS\PROJECTS\N896 62 GORDON RD LAKE COWICHAN\62 GORDON RD EA REPORT.DOCX



203-321 Wallace St, Nanaimo, BC V9R 5B6
SARAH BONAR 250-714-8446 CHRIS ZAMORA 250-714-8864

FIGURE 1
SITE LOCATION MAP(S)



203-321 Wallace St, Nanaimo, BC V9R 5B6
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FIGURE 1A & 1B: 62 GORDON ROAD, LAKE COWICHAN
SITE LOCATION MAP(S)

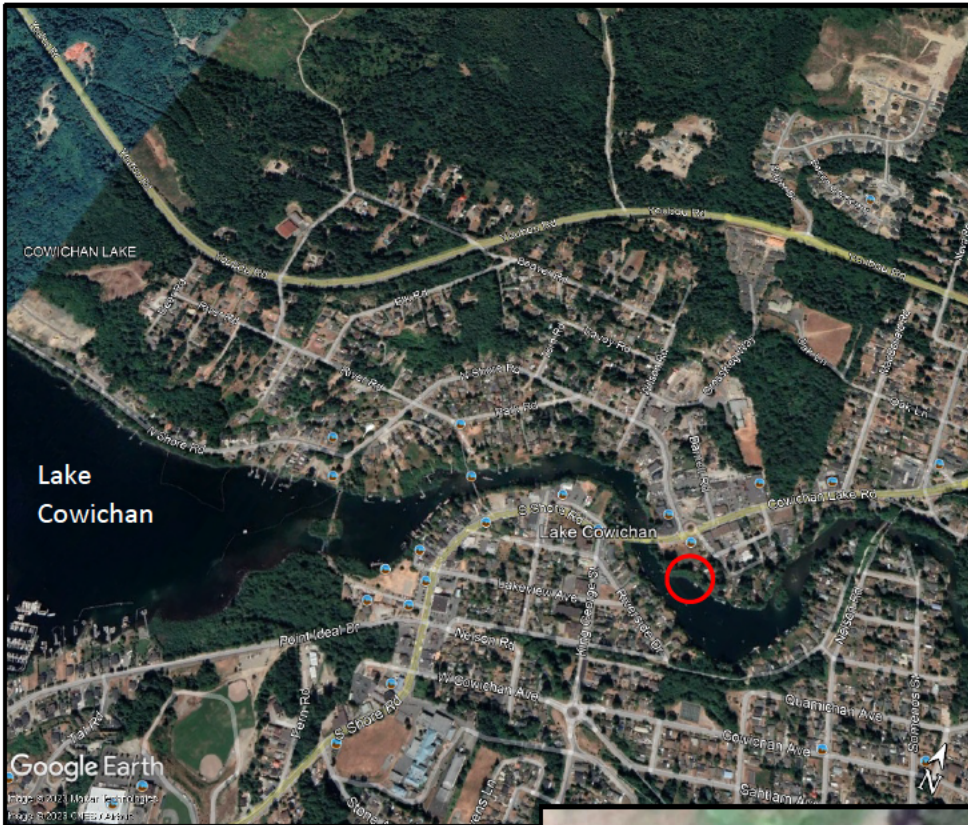
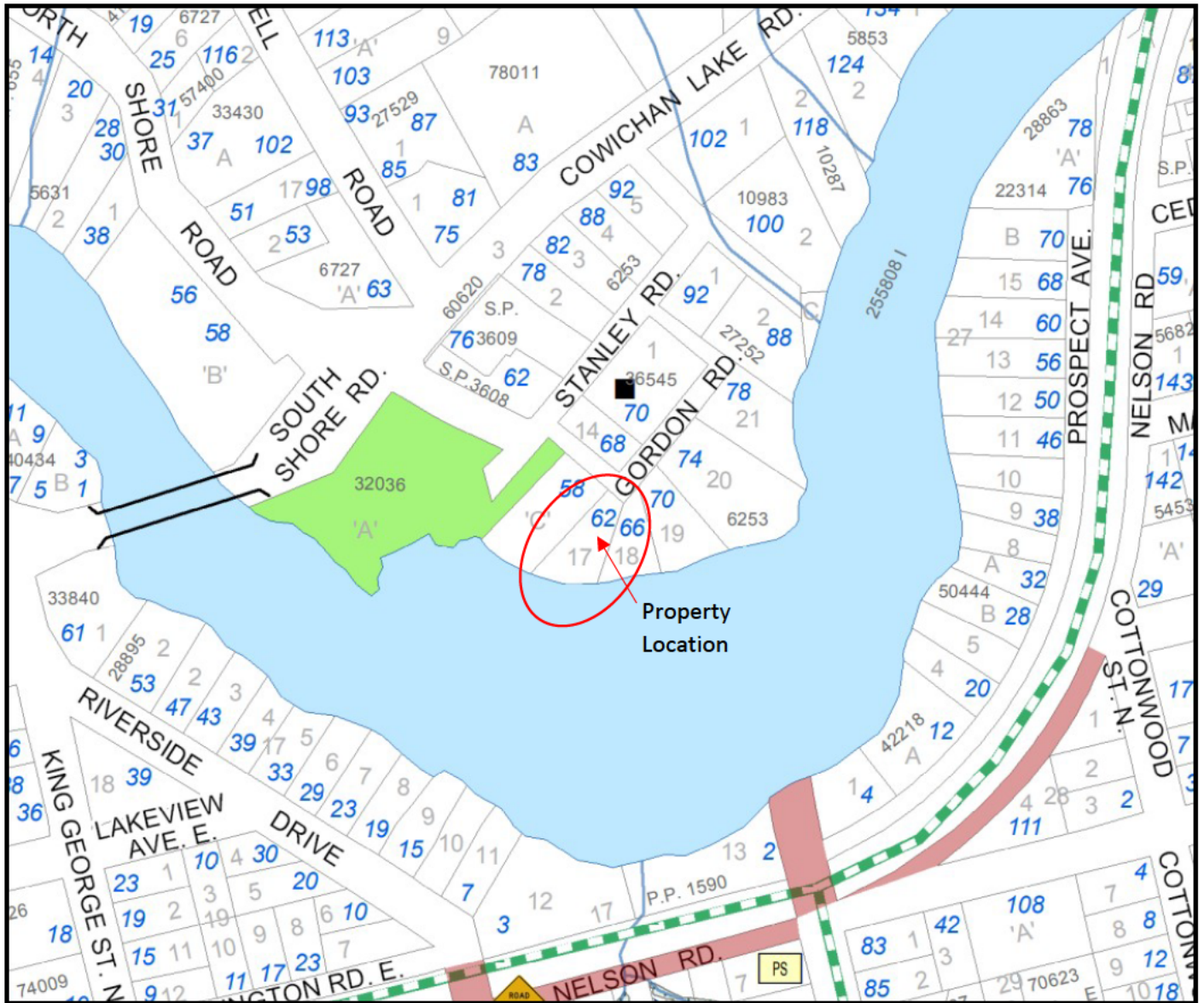


FIGURE 2
TOWN OF LAKE COWICHAN OCP MAP OF SUBJECT PARCEL
62 GORDON ROAD



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Figure 2 – Cowichan Valley Regional District OCP Map 62 Gordon Road



APPENDIX A

62 GORDON ROAD PROPPERTY PHOTOGRAPHS



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APPENDIX A: 62 GORDON ROAD SITE PHOTOGRAPHS

MARCH 2022 SITE VISIT



View looking east along back of 62 Gordon Rd property. Small retaining wall to be removed. Yard is as little as 1.4m wide from house and as wide as 2.6m. Corner of house sloughing. Water last year (Nov 2021) reached foundation of house.

View looking west at back of subject property. Cracked concrete side walk leading to wood deck.



View looking south towards back of property. 15m Riparian DPA to include much of house in it.

Image shows 8" thick concrete retaining wall with cracks and separations.





Images of cracks, separations and anchor rope.



Images (above & left) of hardhack dominated riparian vegetation. Retaining wall is approx. 1.2m above bank and HWM.



Images (Let & right) showing use of small chain and anchor bolts to keep retain wall together. Bank eroded at corner of wall.



OCTOBER 2022 SITE VISIT

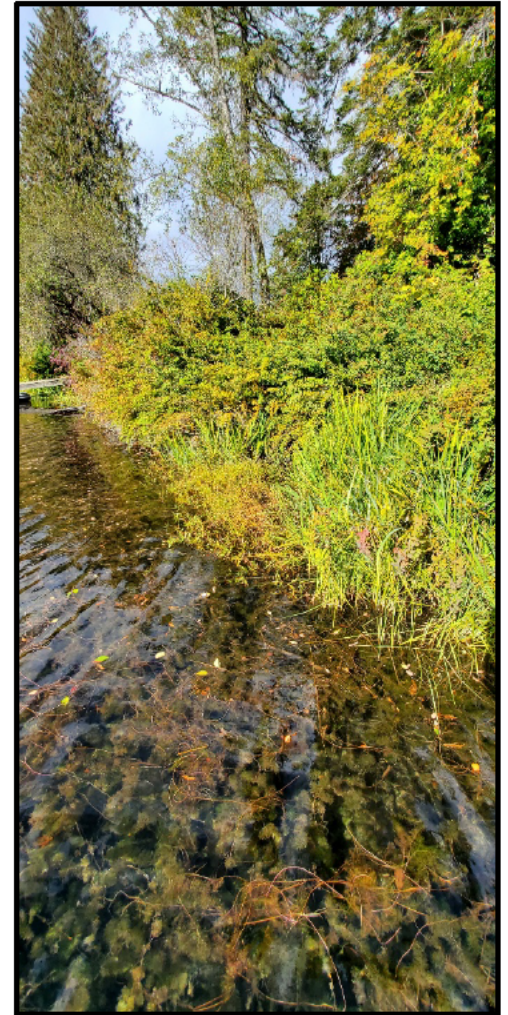
Images (Right & Below). Green-up. Dense hardhack to along existing shoreline providing good shading and shallow water cover during higher river flows.

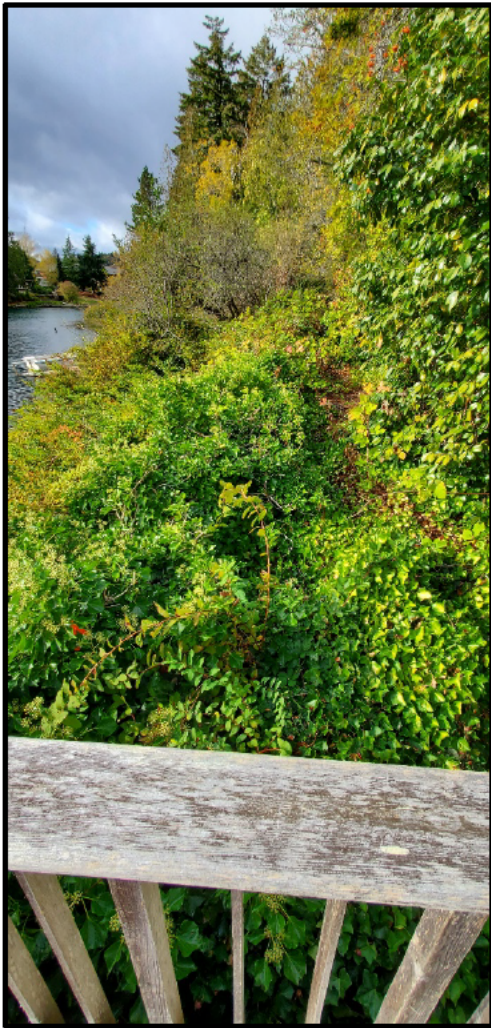


Images (Right & Below). Green-up.
Dense hardhack to along existing
shoreline providing good shading and
shallow water cover during higher river
flows. Image below shows deeper mud
bottom river section.



Images (Right) start of shallow
embayment with Milfoil. Image below;
rope used to anchor dock and wall.





Images (above & Left) Vegetation at top of retaining wall predominately English Ivy, blackberry and hardhack. Area dominated by Invasives.



Example of stacked Verti-Block retaining use.

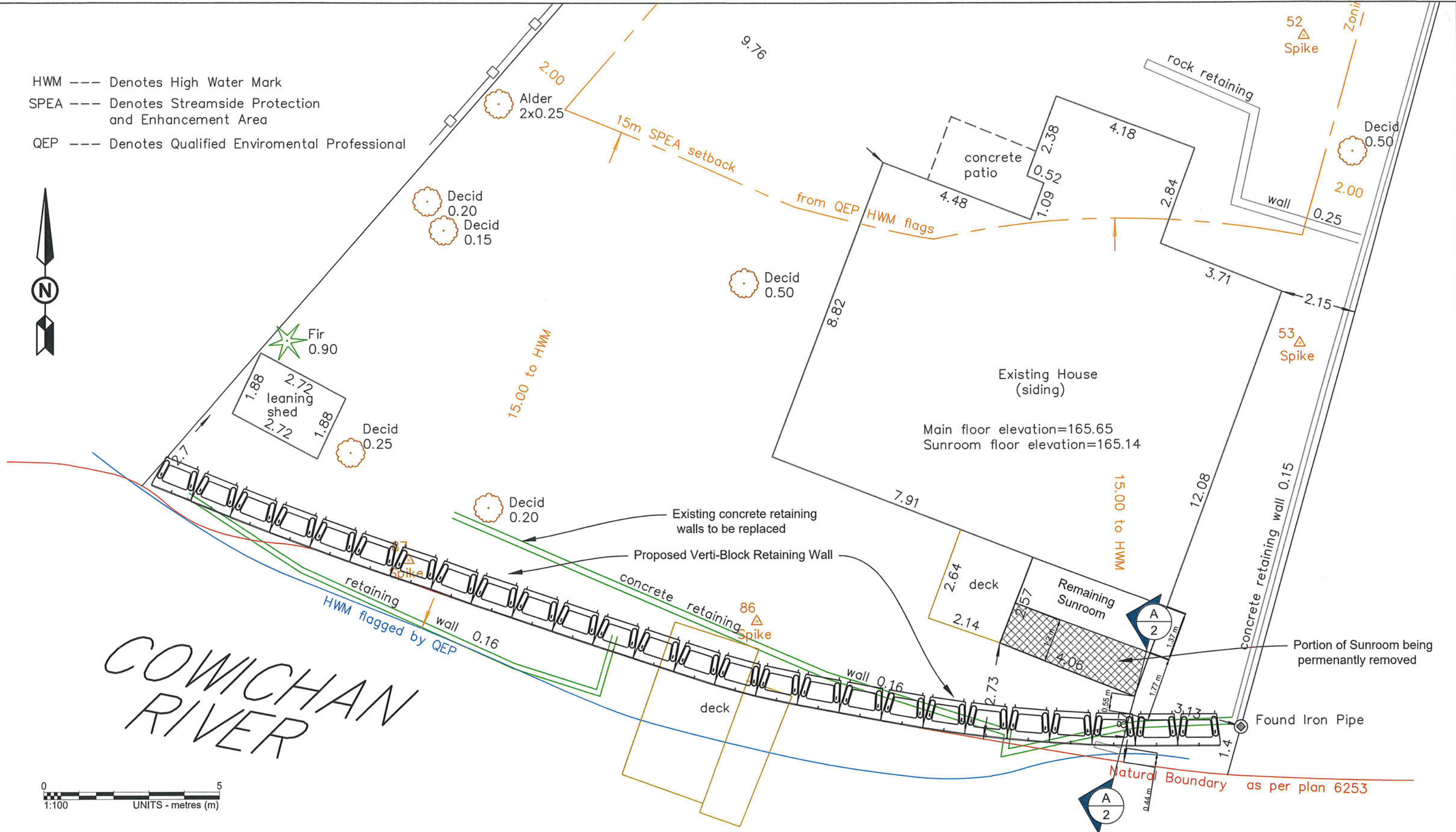
APPENDIX B

RYZUK ENGINEERING VERTI-BLOCK RETAINING WALL DESIGN



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HWM --- Denotes High Water Mark
 SPEA --- Denotes Streamside Protection and Enhancement Area
 QEP --- Denotes Qualified Environmental Professional



COWICHAN RIVER



NOTES

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- This drawing is for the intended use of the client for the specified project, and should not be used elsewhere without the express permission of the client and/or Ryzuk geotechnical.
- Site plan taken from J.E. Anderson & Associates Survey dated June 09, 2022 titled "Site Plan of Lot 17, Section 6, Renfrew district, Plan 6253"

RYZUK
 GEOTECHNICAL
 ENGINEERING & MATERIALS TESTING

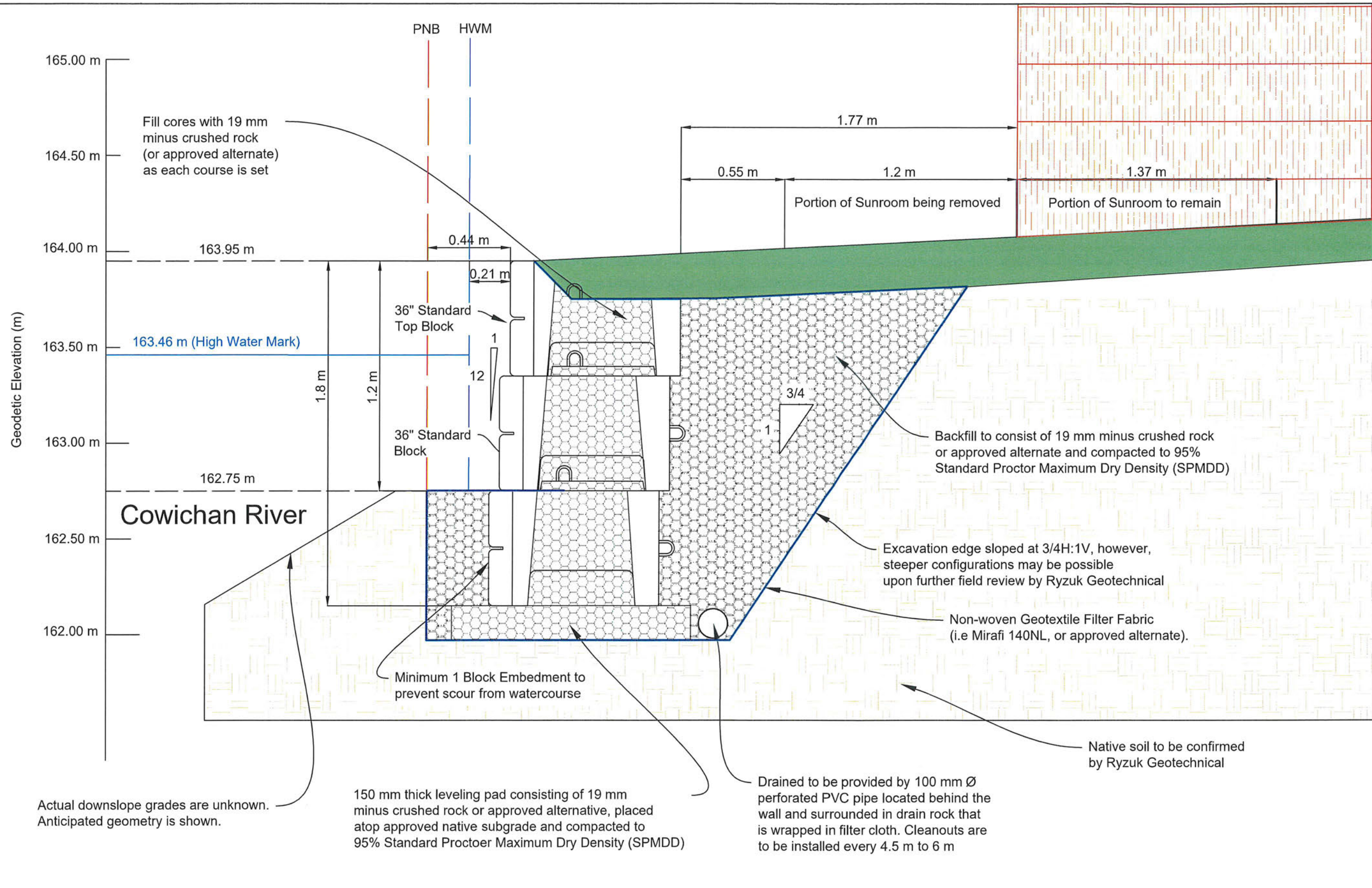
#6-40 CADILLAC AVENUE - VICTORIA, BC V8Z 1T2
 TEL: 250-475-3131
 mail@ryzuk.com

REV.	DESCRIPTION	YY/MM/DD	DRAWN BY
1	ISSUED FOR CONSTRUCTION	23/02/08	KGG
0	ISSUED FOR DISCUSSION	23/01/24	KGG

PROFESSIONAL
 PROVINCE OF
R. T. MOSER
 # 45062
 BRITISH COLUMBIA
 ENGINEER

PTPN: 1002956

PROJECT No.	CLIENT
11078-1	MATTHEW SCUTT
LEAD	PROJECT TITLE
RTM	RETAINING WALL ASSESSMENT
REVIEW	PROJECT ADDRESS
RTM	62 GORDON RD - LAKE COWICHAN, BC
SCALE	DRAWING PACKAGE
1:100	VERTI-BLOCK RETAINING WALL DESIGN
SHEET No.	SHEET NAME
1 of 3	SITE PLAN



Actual downslope grades are unknown. Anticipated geometry is shown.

150 mm thick leveling pad consisting of 19 mm minus crushed rock or approved alternative, placed atop approved native subgrade and compacted to 95% Standard Proctor Maximum Dry Density (SPMDD)

Drained to be provided by 100 mm Ø perforated PVC pipe located behind the wall and surrounded in drain rock that is wrapped in filter cloth. Cleanouts are to be installed every 4.5 m to 6 m

Backfill to consist of 19 mm minus crushed rock or approved alternate and compacted to 95% Standard Proctor Maximum Dry Density (SPMDD)

Excavation edge sloped at 3/4H:1V, however, steeper configurations may be possible upon further field review by Ryzuk Geotechnical

Non-woven Geotextile Filter Fabric (i.e Mirafi 140NL, or approved alternate).

Native soil to be confirmed by Ryzuk Geotechnical

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RTM	RETAINING WALL ASSESSMENT
REVIEW	PROJECT ADDRESS
RTM	62 GORDON RD - LAKE COWICHAN, BC
SCALE	DRAWING PACKAGE
1:20	PROPOSED VERTI-BLOCK RETAINING WALL DESIGN
SHEET No.	SHEET NAME
2 of 3	VERTI-BLOCK RETAINING WALL SECTION

R:\Ryzuk\Drawings\11078-1\62 Gordon Rd\2023\02\02_Verti-BlockRetWall.kgm.dwg

1. GENERAL NOTES

- 1.1. Contractor to inspect the on-site grades and excavations prior to construction and notify Ryzuk Geotechnical if on-site conditions differ from the elevations and grading details shown on the enclosed retainign wall drawings.
- 1.2. Site topographical survey and site grading information provided by J.E. Anderson & Associates dated June 9, 2022.
- 1.3. Geotechnical conditions based on our previous involvement during the existing retaining wall assessment memo dated April 8, 2022.
- 1.4. Contractor is responsible for confirming wall geomtry is compatible with existinhg conditions and proposed works.

2. SUBMITTALS

- 2.1. Contractor to submit grain size distribution, as per ASTM D442-63, testing results to Ryzuk Geotechnical for backfill within 1.2 m of ground surface where foundations, pavement, and/or concrete will be placed/constructed atop. Additionally, grain size distribution testing results may be required during wall construction at the request of Ryzuk Geotechnical.

3. DELIVERY, STORAGE, AND HANDLING

- 3.1. Contractor to inspect materials upon delivery to confirm that the correct type, grade, and colour of materials have been delivered.
- 3.2. Contractor to handle all materials in accordance with manufacturer's recommendations and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure, or other causes. Damaged materials shall not be incorporated into the work.
- 3.3. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Care should be taken to protect the blocks from excessive chipping and breakage. Blocks should not be stacked more than 3 units high in storage areas.

4. MATERIALS

- 4.1. The Verti-Block wall system is to be constructed of precast modular Verti-Block® Standard Blocks (blocks) sized 1.21 m by 0.609 m by 0.914 m (L by W by D). Block materials are to be in accordance with Verti-Block® dwg no. BD-02.
- 4.2. Reinforced backfill to consist of 19 mm minus crushed rock, placed and compacted under the supervision of the Geotechnical Engineer of Record.
- 4.3. Blocks to be infilled with a 19 mm minus crushed rock (road-base) or approved alternate.

5. WALL DESIGN NOTES:

- 5.1. Wall construction and fill placement to be completed with supervision of Ryzuk Geotechnical.
- 5.2. Subgrade material/conditions, block placement, and block embedment to be inspected and approved by Ryzuk Geotechnical.
- 5.3. Block core fill consisting of 19 mm minus crushed rock shall be placed in the precast modular block vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the block core fill is installed in the blocks on the course below. Wall installation to be carried out in accordance with the Verti-Block® Design Manual - Section 4 - Installation.
- 5.4. Ride-on compaction equipment shall not encroach within 1.0 m of the back of wall during construction. No equipment larger than a skid steer should encroach within 1.0 m of the back of wall during construction.
- 5.5. Wall backfill to consist of approved select 19 mm minus crushed rock. Material should be placed in maximum 300 mm lifts and compacted with a large vibratory diesel plate tamper. Backfill is to be compacted to the judged equivalent of 95% Standard Proctor Maximum Dry Density (SPMDD).

- 5.6. Seismic design has been based on a seismic site class C, with a horizontal acceleration coefficient based on a PGA of 0.269 g (10% probability of exceedance in 50 years). For internal MSE stability and global stability, the full $PGA_{10\%}$ was used during design.
- 5.7. The design of the retaining wall is based on Seismic Site Classification C, and the following soil parameters and design loads:

Soil Subgrade - Native Subgrade - Silty Clay
 - Unit Weight: 19 kN/m³
 - Friction Angle: 20 degrees
 - Cohesion: 50 kPa

Structural Backfill - 19 mm Minus Crushed Rock
 - Unit Weight: 21 kN/m³
 - Friction Angle: 36 degrees
 - Cohesion: 0 kPa

- 5.8. Wall designed in accordance with AASHTO 2017-2021 and the Engineers and Geoscientist of British Columbia (EGBC) Professional Practice Guidelines for Retaining Wall Design - Version 1.1.

6. LEVELLING PAD:

- 6.1 Subgrade to be assessed by Ryzuk Geotechnical prior to placement of leveling pad.
- 6.2 Leveling pad should extend laterally from the edge of the block a distance equal to the thickness of the pad to achieve a minimum 1 Horizontal : 1 Vertical splay.
- 6.3 Leveling pad to consist of 150 mm thick layer of 19 mm minus crushed rock, or approved alternate, compacted to a minimum of 98% SPMDD.

7. WALL DRAINAGE:

- 7.1 Wall drainage provided by free draining backfill and perforated drain pipe installed along the base of the wall shrouded in drain rock and wrapped in a non-woven geotextile. Discharge location(s) to be selected by others.
- 7.2 Finished grades to promote positive drainage away from the wall.

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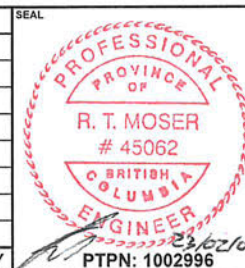


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SEAL



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REVIEW	RTM	PROJECT ADDRESS	62 GORDON RD - LAKE COWICHAN, BC
SCALE	N/A	DRAWING PACKAGE	PROPOSED VERTI-BLOCK RETAINING WALL DESIGN
SHEET No.	3 of 3	SHEET NAME	GENERAL NOTES