2019

# EMP for FILL REMOVAL and NATURALIZATION PLAN 2677 WESTSIDE RD


Arsenault Environmental Consulting Ltd.
1059 Marathon Court, West Kelowna, BC, V1Z 3H9
(250) 300-9206, darryl.arsenault@gmail.com
Arsenaultenv.ca

## Contents



Qualified Professional Checklist for Foreshore Works at 2677 Westside Road

Regional District Central Okanagan – Foreshore Inventory Mapping

Conceptual Design Package (as presented to Brian Robertson 25 September 2019)

Detailed Grading and Planting Plan (18 December 2019)

## 1.0 PROJECT BACKGROUND

Fill has been placed into the lake fronting a house that was constructed at 2677 Westside Road, Regional District Central Okanagan. The Province of British Columbia has requested that the fill be removed where it has been placed onto Crown Land. A survey was completed by Van Gurp and Company Land Surveyors on 26 April, 2017. That survey indicates the fill area is 618.3 $m^2$ below the present natural boundary of Plan 11659 (Attachment 1).

The property owner, Barbara Gordon, have retained Arsenault Environmental Consulting Ltd. (Arsenault) to facilitate a *Water Sustainability Act (WSA)* Section 11 permit to remove the trespassing fill. The application will require an environmental management plan (EMP) and qualified professional (QP) checklist. This document provides an environmental management plan for the fill removal. Additional details are provided in the attached designs and QP checklist. Photo 1 provides an approximate fill area as interpreted over an ortho image from 2009.


*Photo 1. View of the approximate fill area in the lake fronting 2677 Westside Road. The dock and shoreline remain virtually unchanged in 2019 as seen in the air photo.*

The Ministry of Forests, Lands and Natural Resource Operations has the area mapped as a Red-zone for Kokanee (*Oncorhynchus nerka)* spawning. This information means that there is a timing window restriction of June 1 to September 30 for instream work at the property.

Foreshore Inventory Mapping (RDCO 2009 data) identifies the shore segment 215 as being rocky shore substrate, moderate value for juvenile fish rearing, and having a high

Aquatic Habitat Index (AHI) rating. The shore segment has been rated as having a high level of impact (>40%) caused by high dock density (>20 / km), >40% retaining wall coverage, and a high incidence of shoreline modification in the form of boat launches and rock groynes.

## 2.0 HABITAT CONDITIONS

Darryl Arsenault, a qualified environmental professional (QEP) with >26 years of fisheries experience, visited the site on 25 March and 20 August 2019.

The nearshore area at 2677 Westside Road is moderately sloping with a 10% grade from the base of the natural beach to the north and the highwater mark (HWM). The lake bottom drops off steeply at about 15 m from shore. Substrate is dominated by cobble with gravel and a few scattered boulders. Rocks are mainly angular. Some of the shore-zone rock has been placed into a groyne that was constructed at the northeast point of the fill area.

There are no native plants on the fill area. Ornamental shrubs and trees are located within 5 m of the HWM, with a gravel planting bed and grass behind. The existing landscaping provides very little fish and wildlife habitat value.

## 3.0 GUIDANCE DOCUMENTS AND BMPS

The following provincial guidance documents and Best Management Practices (BMPs) have been referenced and included in the compilation of this EMP for the proposed works.

- BC MWLAP. 2004. Standards and Best Practices for Instream Works
- MFLNRO Habitat Officer's Terms and Conditions for Changes in and about a Stream - Okanagan Region.
- Okanagan Region Large Lakes Foreshore Protocol http://www.env.gov.bc.ca/okanagan/esd/ollp/ollp.html

This EMP along with environmental monitoring services will address federal and provincial requirements during the demolition and installation works.

## 4.0 ENVIRONMENTAL MANAGEMENT PLAN FOR FILL REMOVAL

Fill removal will require protection measures. Works will also require an environmental monitor (EM) to be present on-site during instream works, which are expected to take about eight days. The contractor conducting the work on Site must adhere to the recommended measures in this EMP, including those found in the Habitat Officer's Terms and Conditions. The contractor should organize a pre-construction meeting with the EM to review and discuss the EMP in advance of construction.

Fill removal has the potential to introduce deleterious substances to the lake. These substances include sediment, oil and grease, and diesel fuel. Where potential adverse environmental effects are identified below, measures are provided to mitigate.

## *Proposed Mitigation Timing*

Given that the project site is located in a Red-zone, there is a least risk timing window of June 1 to September 30. However, the majoring of the work will occur on dry land. If work can be conducted in isolation from water, then work should be done while water levels are very low.

Regardless of timing, a silt curtain should be placed around the fill removal area prior to work commencing.

## *Isolation of Work Area*

Works with potential to disturb the lake bottom will be isolated from the main body of Okanagan Lake. Isolation can take place with the use of weighted silt curtains or a silt fence held in place within the water's edge by steel stakes. Where possible, silt curtains should be installed to exclude fish from the work area.

Silt curtains will need to be checked regularly to ensure that fish are not able to get into the isolated area, and that turbid water is not released into Okanagan Lake. An environmental monitor (EM) must observe and report on silt curtain effectiveness from the start to finish of the project.

## *Fish Salvage of Work Area*

Fish will be excluded from the work area by dragging silt curtains from the shore out to their position in the lake. If fish are not excluded, then a fish salvage must be conducted. The recommended technique is by beach seine net or minnow trap; although electrofishing may be required. Fish cannot be captured without a valid provincial fish collection permit. Fish exclusion techniques do not require a fish collection permit from the provincial government.

Fish can readily find breaches in silt curtains and tend to enter disturbed areas looking for food items. A QP should check for and remove fish from the contained area as necessary. There are normally very few fish in the nearshore area during cold-water periods. A qualified professional will need to make the decision on whether a fish salvage is needed.

Mussels are fish under the Federal *Fisheries Act*, and as such also need to have a salvage conducted if mussels are present in the area where disturbance will occur. Mussels have not been observed and are not expected to occur in the project area. Work would be done out of the water and if in water would be in < 10 cm water depth.

## *Sediment and Erosion Control*

Sediment-laden runoff is considered a deleterious substance that can adversely affect fish and fish habitat in Okanagan Lake. The Contractor will make all practical efforts to implement sound measures of sedimentation control. The following recommended sediment control BMP's are derived from applicable municipal, provincial, and federal regulations and documents. These measures are not exhaustive and should be adapted by the Contractor as necessitated by changing Site conditions.

The size of staging areas should be minimized and should be located in an area that is agreed upon by the Contractor and the QP.

Specific measures and practices will include but not be limited to the following.

- Conduct all works from dry land with clean well-maintained equipment.
- Remove spoil materials in a way that ensures sediment or debris does not enter the lake.
- Some vegetation clearing will be required for this project. If needed, you need to delineate vegetation clearing limits prior to work commencement. No vegetation can be disturbed without prior approval from the QP. Tree and shrub replacement is built into the naturalization plans.
- The duration of works should be minimized to reduce the amount of time that the soil surface is disturbed.
- Install and maintain sediment control measures (i.e., silt curtains and fences) as directed by the EM to prevent sediment from flowing into the lake from the fill removal area. Regularly inspect these measures to ensure that they are functioning correctly and repaired as soon as possible, if damaged. Utilize sediment control measures that are capable of continuous operation during both working and non-working hours.
- During rain events, or when an area is not in active use for more than two days (i.e., weekends), apply temporary cover to exposed mineral soils through use of polyethylene sheeting or tarps.

Maintenance of sediment control measures is the responsibility of the Contractor. It is expected that the Contractor will also inspect sediment control measures regularly. The EM's role is to oversee the Contractor's program and audit and report on their erosion control measures.

## *Water Quality*

The Contractor will perform construction activities in a manner that prevents degradation of water quality and prevents sediment or sediment laden surface water runoff and debris from entering Okanagan Lake. Turbidity measurements in Okanagan Lake will be taken prior to excavation activities and will be used as a baseline level for comparison purposes.

Sediment-laden Site runoff will be monitored by the EM to verify suitable water quality in the lake outside the silt curtain. The Contractor should stop work immediately if turbidity in the lake past 15 m beyond the silt curtain exceeds the values listed in Table 1, and the EM and Contractor should take immediate steps to determine the source of the problem and attempt to rectify the situation prior to restarting work.

**Table 1: Water Quality Guidelines for Turbidity (BC MOE 2001).**

| Water Use | Maximum Induced Turbidity (NTU or % of background) | Maximum Induced Suspended Sediments (mg/L or % of background) |
|---|---|---|
| Aquatic Life | Change from background of 8 NTU at any one time for a duration of 24 hrs in all waters during clear flows or in clear waters | Change from background of 25 mg/L at any one time for a duration of 24 hrs in all waters during clear flows or in clear waters |
| | Change from background of 2 NTU at any one time for a duration of 30 days in all waters during clear flows or in clear waters | Change from background of 5 mg/L at any one time for a duration of 30 days in all waters during clear flows or in clear waters |
| | Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters | Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters |
| | Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters | Change from background of 10% when background is >100 mg/L at any time during high flows or in turbid waters |

## *Spill Prevention and Response Plan*

To minimize the potential for a spill or release of hydrocarbons or other hazardous materials, it is recommended that a Spill Prevention Plan be implemented during all refuelling of construction machinery and/or the storage and handling of hazardous materials. The following is a list of spill prevention and response measures, including general measures, refuelling areas, spill response, spill clean-up, and spill reporting procedures. This list is not exhaustive and should be adapted as necessitated by the changing site conditions.

- All equipment (excavator and trucks) and machinery (pumps) are in good operating condition and are free of leaks or excess oil and grease. If necessary power-wash equipment prior to entering the Site.
- Spills occurring on dry land will be contained, scraped and stored for disposal upon Project completion. Contaminated material will be stored on polyurethane tarps and covered to prevent mobilization, and will be disposed of in accordance with the regulations outlined in the BC Environmental Management Act (2003) and Spill Reporting Regulation (2004).
- Personnel shall not leave equipment unattended during refuelling to prevent the overfilling of the equipment.
- All containers of fuels, oils, or other flammable and combustible products that are temporarily stored onsite in the designated refuelling area must be placed within an impervious secondary containment or equivalent double lined tank.

- If heavy machinery is used, a spill containment kit shall be readily accessible onsite in the event of an accidental release of a deleterious substance to the environment. Ensure all construction personnel are sufficiently trained in the location and use of spill prevention equipment.
- Immediately report all spills of deleterious substances, no matter how small, to the Environmental Monitor and to the senior personnel onsite. The EM will report spills of reportable quantities to the Provincial Emergency Program (PEP) 24-hour phone line at 1-800-663-3456. Where it is not practical to report to PEP within a reasonable time, spills should be reported to the local detachment of the Royal Canadian Mounted Police.

## *Site Restoration*

Removal of the fill is a positive step towards natural restoration of the foreshore area fronting the property. The lake bottom must be returned to similar grade and state as the natural grade of the shoreline in the area, or as stipulated in the attached grading plan. No excavations or depressions are to remain within the re-graded area.

All concrete materials, if discovered during excavation, must be removed from the site and disposed of appropriately. Similarly, if rebar is present in the concrete, it must be disposed of appropriately as well. Metals can be delivered to a metal salvage company for recycling and some facilities take concrete for recycling.

An inventory of riparian vegetation (trees and shrubs) damaged or removed in order to facilitate the works will be conducted by the EM. The grading and planting plan is attached to this document. A total of 35 trees and 143 shrubs (as well as 40 sedge) will be planted on the naturalized riparian benches for a habitat gain of over 300 $m^2$. Over 200 $m^2$ of Kokanee spawning habitat will be created by lowering the fill to between 341.5 and 340.75 m, and about 120 $m^2$ of beach bench will be created upslope of the spawning area. The beach bench is intended to provide a source of spawning gravel for the lowest bench.

## *Environmental Monitoring*

The primary role and responsibilities of the EM are to promote protection of the environment and to monitor compliance with environmental laws, permits, and approvals, and effective implementation of mitigation measures employed by the Contractor. The EM will work closely with the Contractor's Project Manager and/or Site Supervisor to direct the team to avoid activities or operations which are in contravention of environmental legislation, permits, and approvals; or have the potential to cause environmental damage.

The responsibilities of the EM include the following tasks.

- Attend pre-construction and construction meetings with the Contractor. This will enable the EM to determine schedule, duration, and timing of milestone events.
- Supervise implementation of the mitigation measures and BMP's for the works. Assist the Contractor with these measures and recommend additional mitigation measures as required.

- Provide advice to the Contractor with respect to installation of sediment and erosion controls and other mitigation measures as specified in the EMP.
- Conduct a fish salvage to remove fish from any isolated work area.
- Monitor water quality during the works. Turbidity levels exceeding provincial water quality criteria will result in a work stoppage until the sediment source is identified and corrective actions are taken.
- Prepare a report that summarizes the work completed and includes a summary of environmental incidents, if any, of non-compliance, and the corrective actions taken or to be taken, such as environmental mitigation or enhancement works.
- In the unlikely event of an environmental incident, the EM will provide a report to the client and the Contractor, and if warranted, to applicable regulatory agencies as soon as practicable but within 24 hours of their response to an incident.

**The EM has the authority to modify or halt any construction activity that is causing, or potentially causing, damage to fish and wildlife populations or their habitats**.

Regular site visits will include but may not be limited to the following tasks.

- Recording of weather and other environmental conditions, including the results of water quality monitoring. Water quality (turbidity) in the lake will be monitored prior to and throughout the works. Measurements will be taken in Okanagan Lake inside the silt curtain and within 15 m to 30 m (to the north and south) of the works location. Direction of measurement will be dependent on wind and current during instream works.
- Overview of project construction progress.
- Opportunistic observations and spot-inspections of equipment for state of repair.
- Inspection of sediment control structures to assess conditions, and possible need for maintenance, repairs or replacement.
- Communications with the Contractor to discuss current observations and noted deficiencies or successes, to follow up on action items, and to anticipate and coordinate construction sequencing and tasks with erosion and sediment control practices.
- Liaison with regulatory agencies and reporting, as necessary.

## 5.0 CONCLUSIONS

The EMP provides schedules, procedures, and mitigation measures to systematically manage the environmental priorities, responsibilities, and risks associated with the Project, including fill removal and habitat enhancement. The primary risk associated with the Project is the potential for damaging aquatic species and habitat within and near Okanagan Lake. However, if the Contractor adheres to the BMP's and mitigation measures provided in this Report, the Project can be completed with minimal adverse effects and no serious harm to aquatic species and habitat at the Site. Ultimately, the

Project should result in a net gain in habitat value and fish production in the area once the encroaching fill is removed.

## 6.0 REFERENCES

BC MOE. 2001. Water Quality, Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments, Overview Report. Written by H. Singleton, Water Management Branch, Ministry of Water, Land and Air Protection.

BC MOE. 2007. Thompson Region Timing Windows, Okanagan Sub-Region. Accessed online <http://www.env.gov.bc.ca/wsd/regions/thr/wateract/work_windows_jan17_2007.pdf

BC MOE and Fisheries and Oceans Canada (DFO). 2008. Standards and Best Practices for Instream Works – Culverts. Version 1.0. <http://www.env.gov.bc.ca/wld/instreamworks/downloads/Culverts.pdf>

BC Ministry of Water, Land and Air Protection (BC MWLAP). 2002. A Field Guide to Fuel Handling, Transportation and Storage, third edition. BC WLAP and BC Forest Service. Available online at: <http://www.env.gov.bc.ca/epd/industrial/oil_gas/pdf/fuel_handle_guide.pdf>.

BC Ministry of Water, Land and Air Protection. 2004. Standards and Best Practices for Instream Works. Ministry of Water, Land and Air Protection, Ecosystem Standards and Planning, Biodiversity Branch. Victoria, BC. 168 pp.

DFO. 2010. Riparian Areas and Revegetation. DFO Pacific Region. Accessed online http://www.dfo-mpo.gc.ca/Library/315523.pdf

Environment Canada. 2017. Water Office data search. Accessed on 10 November 2017. https://wateroffice.ec.gc.ca/mainmenu/real_time_data_index_e.html.

Government of BC. 2003. *Environmental Management Act [SBC 2003] Chapter 53* [current to April 29, 2015]. Queen's Printer, Victoria, BC. http://www.bclaws.ca/civix/document/LOC/complete/statreg/--%20E%20--/Environmental%20Management%20Act%20[SBC%202003]%20c.%2053/00_Act/03053_02.xml

Regional District Central Okanagan (RDCO). Interactive web map viewing tool. http://www.regionaldistrict.com, accessed 6 February 2018.

## QUALIFIED PROFESSIONAL CHECKLIST FOR FORESHORE DEVELOPMENTS

**Project Type:** **Fill Removal and Shoreline Softening**

**Location:** **2677 Westside Road, West Kelowna, BC**

**Owners:** **Barbara Gordon**

The Qualified Professional (QP) Checklist is **required** for all foreshore developments with a **Moderate** or **High Risk** activity ranking (see Section 3.2). In addition a QP Checklist is required for Low Risk activities where Best Management Practices (BMPs) are not being followed.

| Activity | | Foreshore Sensitivity Zone | | |
|---|---|---|---|---|
| Type | Risk Ranking | Shore Spawning Kokanee | Freshwater Mussels | Foreshore Plants |
| Shoreline Improvement | Moderate | Red | No Colour | No Colour |

## General Foreshore Values

Complete the following table for all foreshore developments with a Moderate or High Risk (or Low Risk where BMPs are not being followed).

| Question | Yes, No or N/A | Explanation |
|---|---|---|
| Are you a QP as identified above? | Yes | Professional biologist specializing in freshwater biology for 27 years; 21 years in the Okanagan. |
| Have you discussed this project with an Ecosystems Biologist or other provincial staff member? If so, provide the staff member's name. | Yes | I have been discussing the project with Brian Robertson, an Ecosystem biologist in Vernon. He has agreed to the concept of removing fill and leaving flood benches to restore nearshore fish spawning and enhance riparian zone functionality. Brian has requested the creation of detailed designs.<br>Kokanee red-zone. |
| Have you reviewed all environmental data sources including BC Conservation Data Centre (CDC), wildlife species inventory (WSI), Fisheries Information Summary System (FISS) and EcoCat for available fisheries, aquatic habitat mapping, and SEAR data? | Yes | Most relevant data are the Foreshore inventory mapping (FIM) and the FLNRO habitat mapping for Kokanee, Rocky Mountain Ridged Mussels, and rare shoreline plants. Segment 215 with gravel shore, high AHI and moderate juvenile rearing and narrow littoral zone width. No rare species occurrences from CDC. |
| Have you conducted a field assessment of the site to document environmental values associated with the site? If yes, list these values. A field assessment is expected in most cases. | Yes | Arsenault visited the site on 25 March 2019, and again on 20 August 2019. Arsenault was also on site during earlier foreshore restoration works during spring 2007. The shoreline was partially restored at that time in response to a Fish Act violation investigation. Riparian planting and restoration on the Crown Land portion |

| | | |
|---|---|---|
| | | in front of the property was not completed. There is a rip-rap covered front edge protecting a relatively flat area that has a strip of decorative landscaping between the rip-rap and a grass lawn area (see photos). |
| Have you conducted inventories to confirm presence/absence of fish, wildlife, SEAR or their habitats onsite? If yes, list which species. Inventories must follow provincial standards and must be conducted during the appropriate time of year. | No | No mussels or shell fragments were found. |
| Have SEAR been newly identified at the site? If yes, list these SEAR. Have results been submitted to the BC CDC using appropriate forms? | No | No new SEAR detected. |
| Have you assessed potential changes to local shoreline and stream mouth accretion/erosion dynamics as a result of the project? This is a requirement for marina, infill and erosion protection works projects. | N/A | Not near a stream mouth. Lake fill being removed and accommodation granted for improved shoreline circulation. |
| Are works scheduled during the least risk timing window for fish and wildlife species[6]? List this window. | No | The works should be done during low water to keep the work out of water as much as possible. Start work as soon as Kokanee fry have emerged from the shoreline gravel. Isolate the work area. A variance will be required so instead of June 1 to September 30, the work should be conducted on about April 1 to April 30 |
| Does the project follow the standard *Habitat Officers' Terms and Conditions* and existing BMPs[7] during construction of the project? Developments must follow the terms and conditions in order to be compliant with the *Water Sustainability Regulation*. | Yes | The project meets habitat officer's terms and conditions (except timing window). |
| Are site-specific mitigation measures (e.g., avoid, redesign, relocate, minimize) required? If yes, list these measures. | Yes | Removing historic lake fill and naturalizing the fill area.<br>The moorage dock area meets BMPs and will remain the same but a pier extension will be required.<br>A silt curtain will be required to isolate the work area from Okanagan Lake. |
| Are there residual effects to environmental values as a result of the project (i.e., adverse effects that cannot be mitigated)? | No | Small project with minimal anticipated effects (not including cumulative effects) |
| If residual effects have been identified, have offsetting measures been agreed to, to compensate for adverse effects to environmental values? | No | No residual effects identified |
| Has a QP been retained to provide environmental monitoring? | Yes | EM will also provide guidance on habitat restoration and planting of native plants (placement of logs, rocks, and plants). |
| Is ongoing maintenance and/or monitoring required? If so, describe the plan for ongoing maintenance and/or monitoring. | No | No residual effects so no monitoring required. |

## Freshwater Mussels

Follow the species-specific guidance provided in *Guidance for Freshwater Mussels in the Okanagan*

| Question | Yes, No or N/A | Explanation |
|---|---|---|
| Do you meet the minimum surveyor qualifications? | Yes | Certified by taking training course with Lora Nield during 2015. Have also conducted numerous snorkel and shore-transect surveys in known mussel zones and no-colour zones. Lead biologist on large mussel salvage project at Summerland Yacht Club prior to dredging activities during 2012 and 2013. |
| Have you conducted a Freshwater Mussel Survey of the site as per the methods identified in Section 4.0? | No | There is no work proposed within the water, if works are done during low water conditions. |
| Have mussels been newly identified at the site as a result of the Freshwater Mussel Survey? Have results of all mussel species occurrences been submitted the CDC[5]? | No | No mussel shells, alive or dead, were detected at the site. |
| If mussels have been previously or newly identified at the site, what mitigation measures been proposed to reduce the potential for adverse effects as a result of the project (refer to Guidance Document)? | N/A | No mussels detected and presence unlikely in the area proposed for fill removal. |
| Are there residual effects to mussels as a result of the project (i.e., adverse effects that cannot be mitigated)? | No | No mussels detected or likely |
| If residual effects have been identified, have offsetting measures been proposed to compensate for adverse effects to mussels? | N/A | No residual effects |

## Foreshore Plants

Follow the species-specific guidance provided in *Guidance for Foreshore Plants in the Okanagan*

| Question | Yes, No or N/A | Explanation |
|---|---|---|
| Do you meet the minimum surveyor qualifications? | Yes | I have studied the recovery documents for rare plants in the Okanagan and conducted rare plant inventories on Okanagan and Osoyoos lakes. |
| Have you conducted a Preliminary Habitat Assessment of the site as per the methods identified in Section 4.1? | Yes | The impacts on rare plants are considered to be low given that all shore alterations are in areas composed entirely of fill material and ornamental landscaping. |
| Is high potential plant species at risk (SAR) habitat present (Section 4.1, Table 3)? | No | Not likely plant SAR habitat since it is an ornamental landscape. |
| Is a Detailed Plant SAR Survey required based on the habitat present? If yes, have you conducted a Detailed Plant SAR Survey of the site as per the methods identified in Section 4.2? | No | No plant SAR habitat present |
| Have plant SAR been newly identified at the site as a result of the Detailed Plant SAR Survey? Have results been submitted to the CDC? | No | No SAR detected or expected |
| If plant SAR have been previously or newly identified as the site, what mitigation measures have been proposed to reduce the potential for adverse effects to plant SAR as a result of the project? | N/A | No plant SAR records or detected |
| Are there residual effects to plant SAR as a result of the project (i.e., adverse effects that cannot be mitigated)? | N/A | No plant SAR and if there were, the impacts from pile placement would be marginal |
| If residual effects have been identified, have offsetting measures been proposed to compensate for adverse effects to plant SAR? | N/A | No residual effects identified |

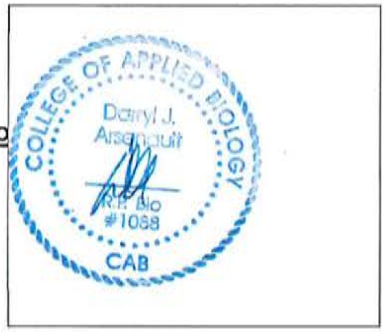
I confirm that all information provided in this checklist is to the best of my professional knowledge true and completed

**Signature** _____

**Name of Qualified Professional** Darryl Arsenault, MSc, RPBio

**Professional Association Number** RPBio #1088

**Date** 19 December 2019




## Photos

***Photo 1.*** *2677 Westside Road is the property on the left side of the picture. Black line is approximate property boundary. There are two rock groynes marked in the Foreshore Inventory Mapping database, and indicated by arrows.*

***Photo 2.*** *Fill area and dock at 2677 Westside Road. The plan is to remove some of the fill and create flood benches to enhance fish and wildlife habitat.*

***Photo 3.*** *The existing dock and house as viewed from the southeast. The property has been listed for sale.*

***Photo 4.*** *View of Crown Land fill area to the left of the property pin at the right side of the picture (see arrow). The fill removal area is approximately within the marked polygon.*

***Photo 5.*** *View of the existing shoreline that will be removed to about the same elevation as that seen in the water to create a 10 to 15 m wide Kokanee spawning shelf, expanding on the size of the shelf that can be seen in the photo. No materials will need to be deposited in the lake. The existing slope edge, indicated by the line, was created during spring 2007. It is anchored by large rocks.*

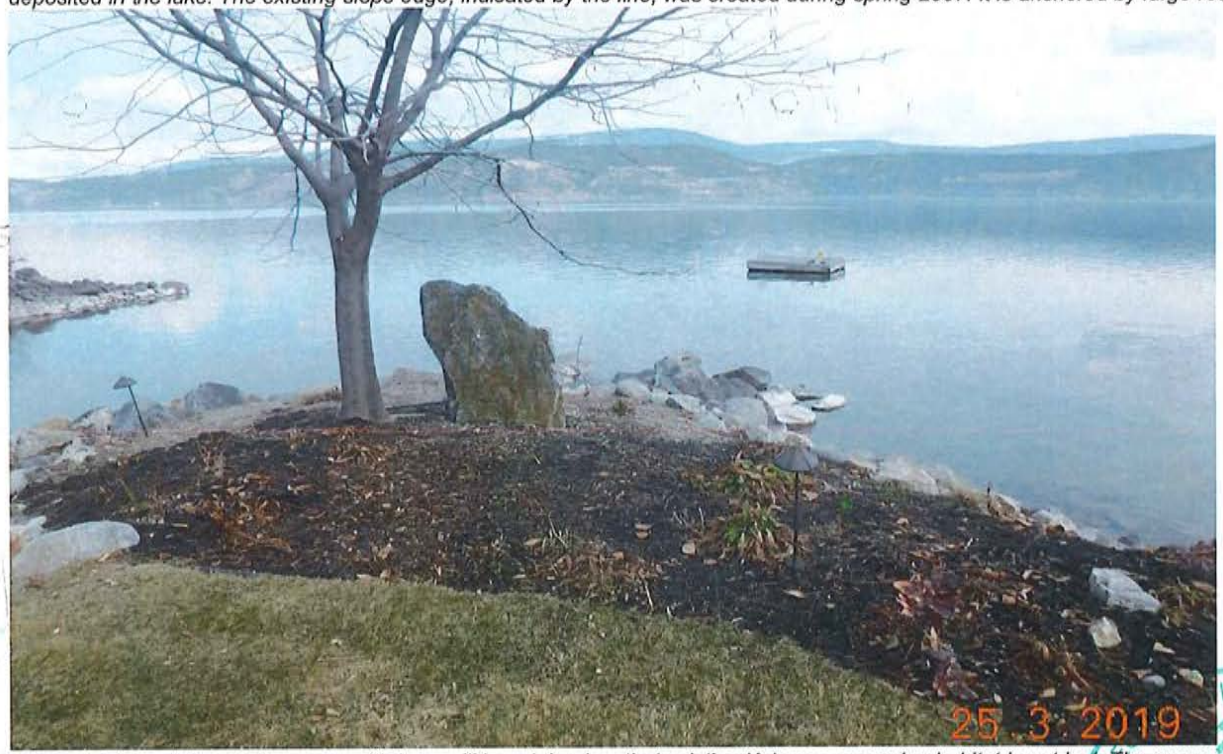



***Photo 6.*** *The existing rock groyne, with tree, will be retained so that existing Kokanee spawning habitat is not lost. The groyne will effectively become an island at high water levels. Native trees that are adapted to water will be planted on the island.*

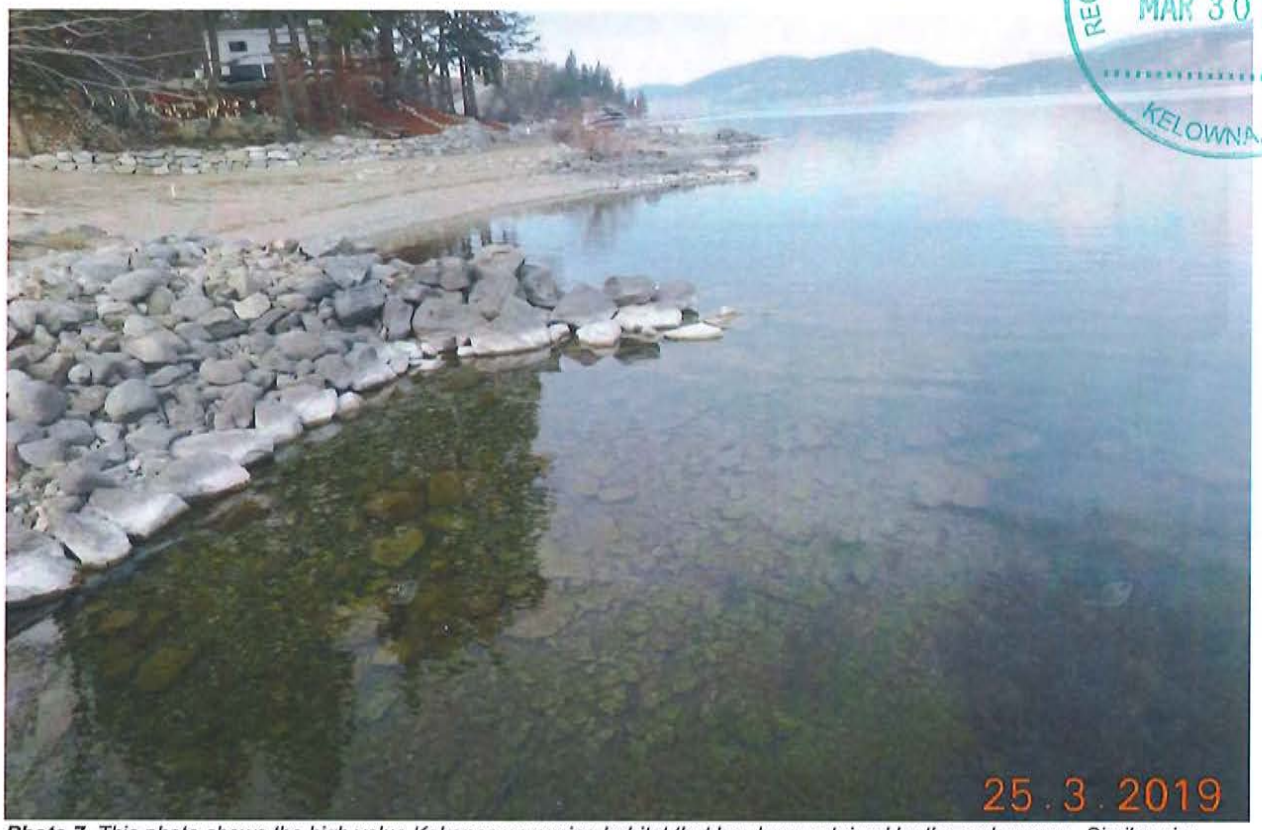



***Photo 7.*** *This photo shows the high value Kokanee spawning habitat that has been retained by the rock groyne. Similar-size gravel will be placed as is normally found in Black-zone Kokanee spawning areas (e.g., Paul's Tomb shoreline).*


***Photo 8.*** *After fill is removed, the shoreline will match the natural shoreline that can be seen fronting the cabin in the left of the photo. Native shrubs and trees will be planted to restore the area to native ecosystem condition.*


***Photo 9.*** *Native riparian vegetation consists of red-osier dogwood, Oregon grape, and Nootka rose shrubs and black cottonwood, ponderosa pine, and Douglas fir trees. These same species will be used to restore the riparian area (outlined) on the reclaimed lake edge.*


***Photo 10.*** *The fill area will become a series of flood benches that will vary from being underwater at all times to only being flooded during extreme events (like that seen during spring 2017). There will be a net habitat improvement.*


***Photo 11.*** *The new shoreline will follow trajectory of the existing shore to the south. See line for approximate example. The area to the right of the line will be a series of four flood benches and a Kokanee spawning bench.*


***Photo 12.*** *Areas above the average lake level of 342.15 m will be naturalized with large woody debris, large rocks (picked from the existing rip-rap), and native plants that are suitable to the flood regime. See detailed grading plan.*

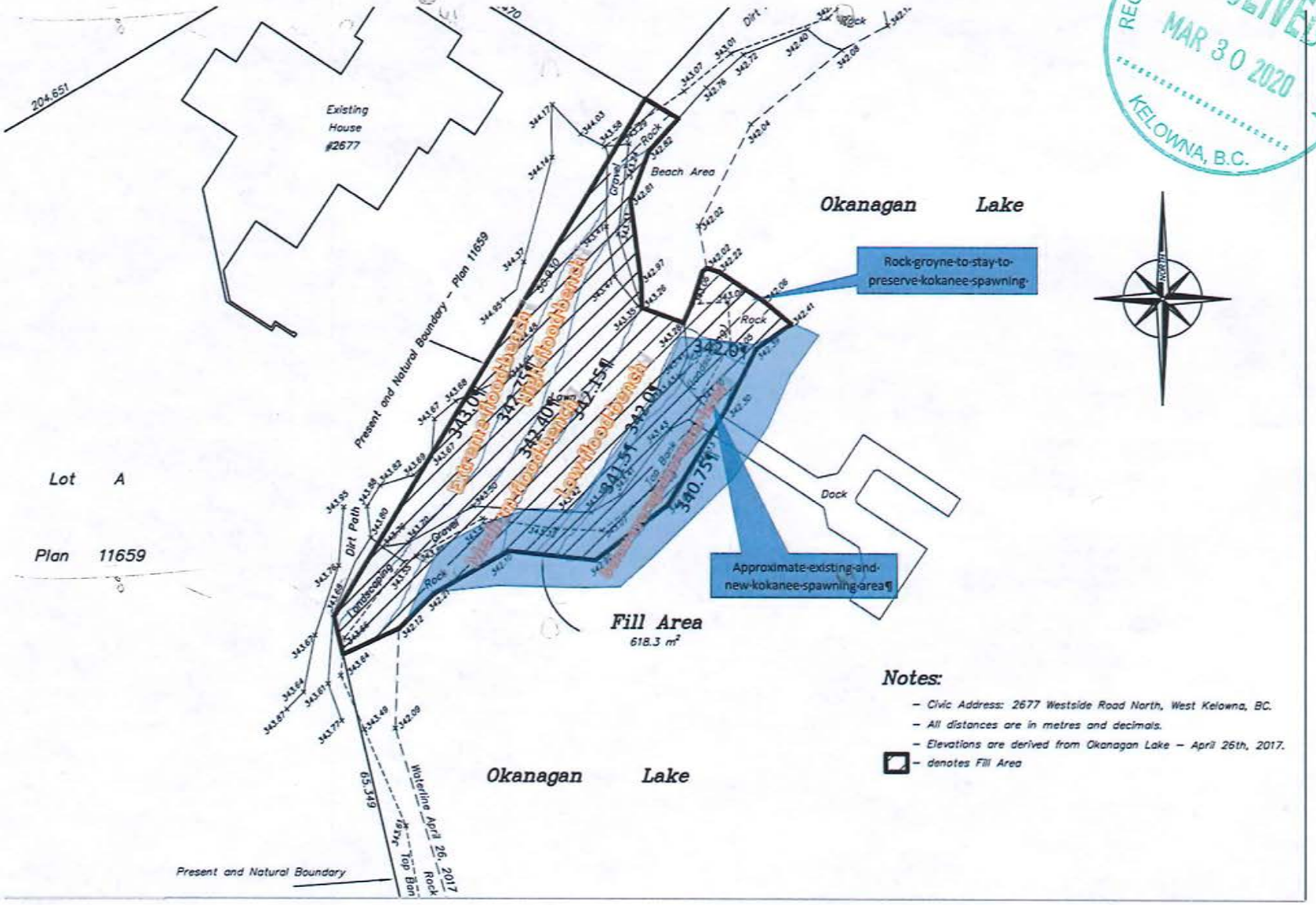
Regional District of Central Okanagan

High Value Aquatic Habitat Index near 2677 Westside Road



## Conceptual Grading Plan at 2677 Westside Road



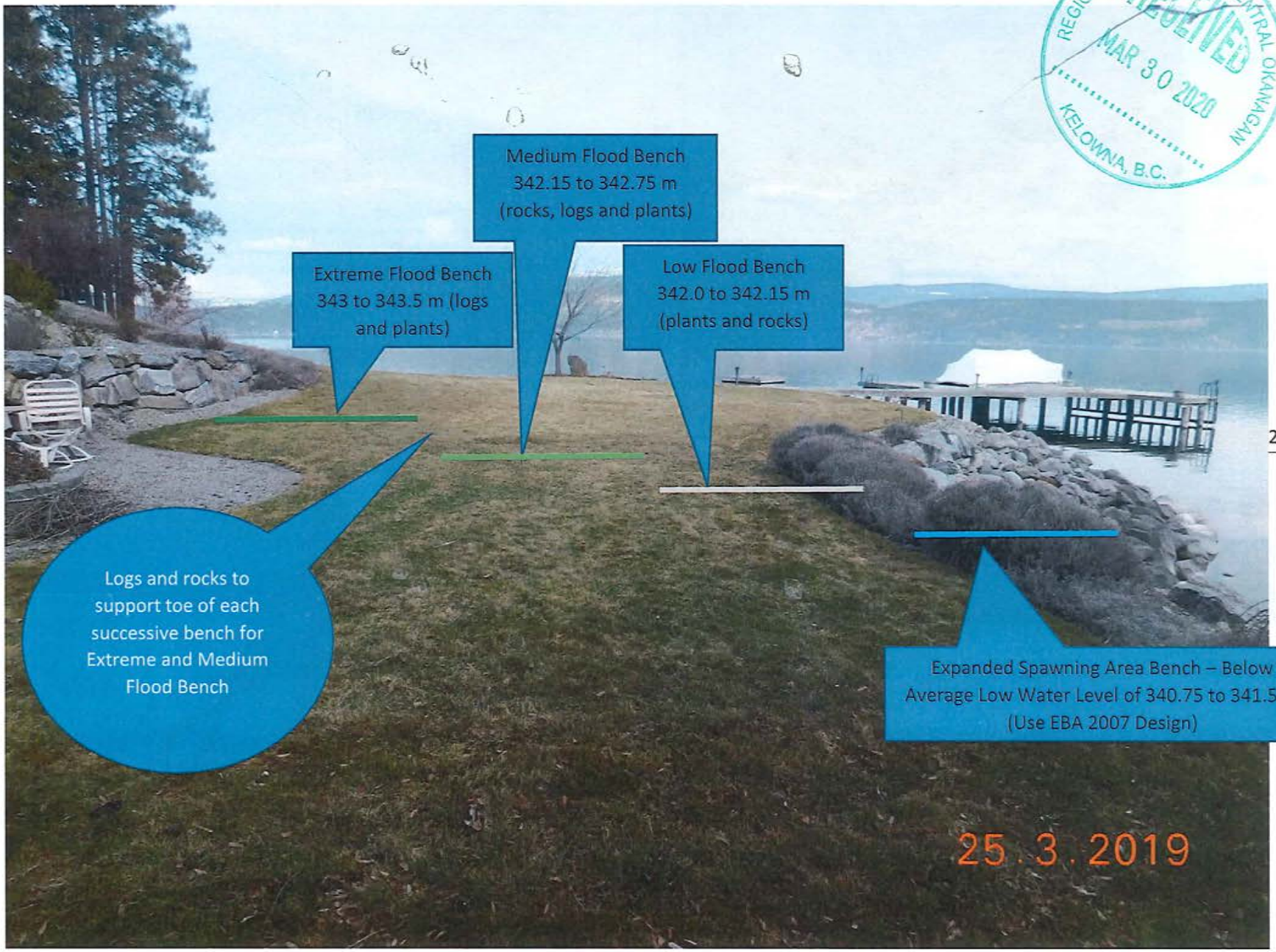





## Arsenault Environmental Consulting Ltd. – 17 December 2019

## Conceptual Grading Plan at 2677 Westside Road





**Conceptual Grading Plan at 2677 Westside Road**






**Arsenault Environmental Consulting Ltd. – 17 December 2019**

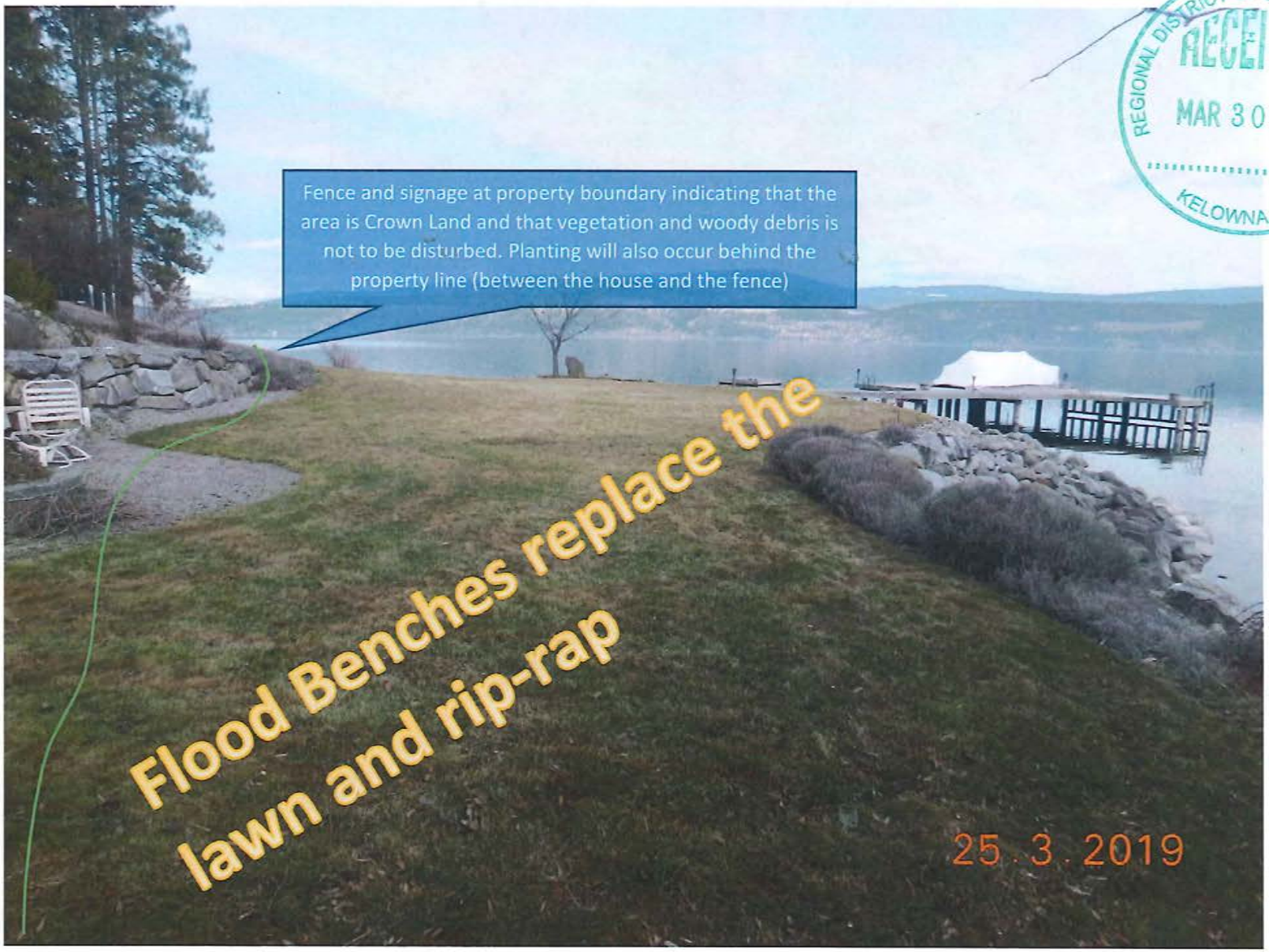
**Conceptual Grading Plan at 2677 Westside Road**






**Arsenault Environmental Consulting Ltd. – 17 December 2019**

**Conceptual Grading Plan at 2677 Westside Road**








**Arsenault Environmental Consulting Ltd. – 17 December 2019**

## Planting Plan

**Polygon A (Upper Riparian Bench)** – 6 Logs*, 6 Trembling Aspen, 4 Black Cottonwood, 4 Ponderosa Pine, 2 Common Juniper, 12 Red-osier Dogwood, 10 Prickly Rose, 10 Snowberry, 50 m spit-rail cedar fence, and two signs on fence (Crown Land – Do Not Disturb Vegetation).

**Polygon B (Riparian Bench)** – 6 Logs*, 5 Douglas Fir, 4 Trembling Aspen, 8 Chokecherry, 4 Black Cottonwood, 4 Ponderosa Pine, 10 Red-osier Dogwood, 15 Nootka Rose, 12 Oregon Grape, 15 Large Rocks and 6 small Logs scattered along the bench

**Polygon C (Riparian Flood Bench)** – 10 Logs**, 30 Sandbar Willow, 14 Red-osier Dogwood, 5 Pacific Willow, 20 Nootka Rose, 40 Sedge Grass, and 30 Large Rocks and 8 Small Logs scattered along the bench

**Polygon D (Rocky Beach)** – 15 Logs**, 30 Large Rocks, gravel and cobble (5 to 25 cm diameter angular) to at least 50 cm substrate depth

**Polygon E (Spawning Bench)** – 70 Large Rocks, 50 cm deep of 5 to 25 cm diameter angular gravel. Most large rocks to support next shelf but some scattered for habitat diversity

*logs of at least 30 cm diameter

**logs of at least 40 cm diameter

# Fill Removal Grading Plan View

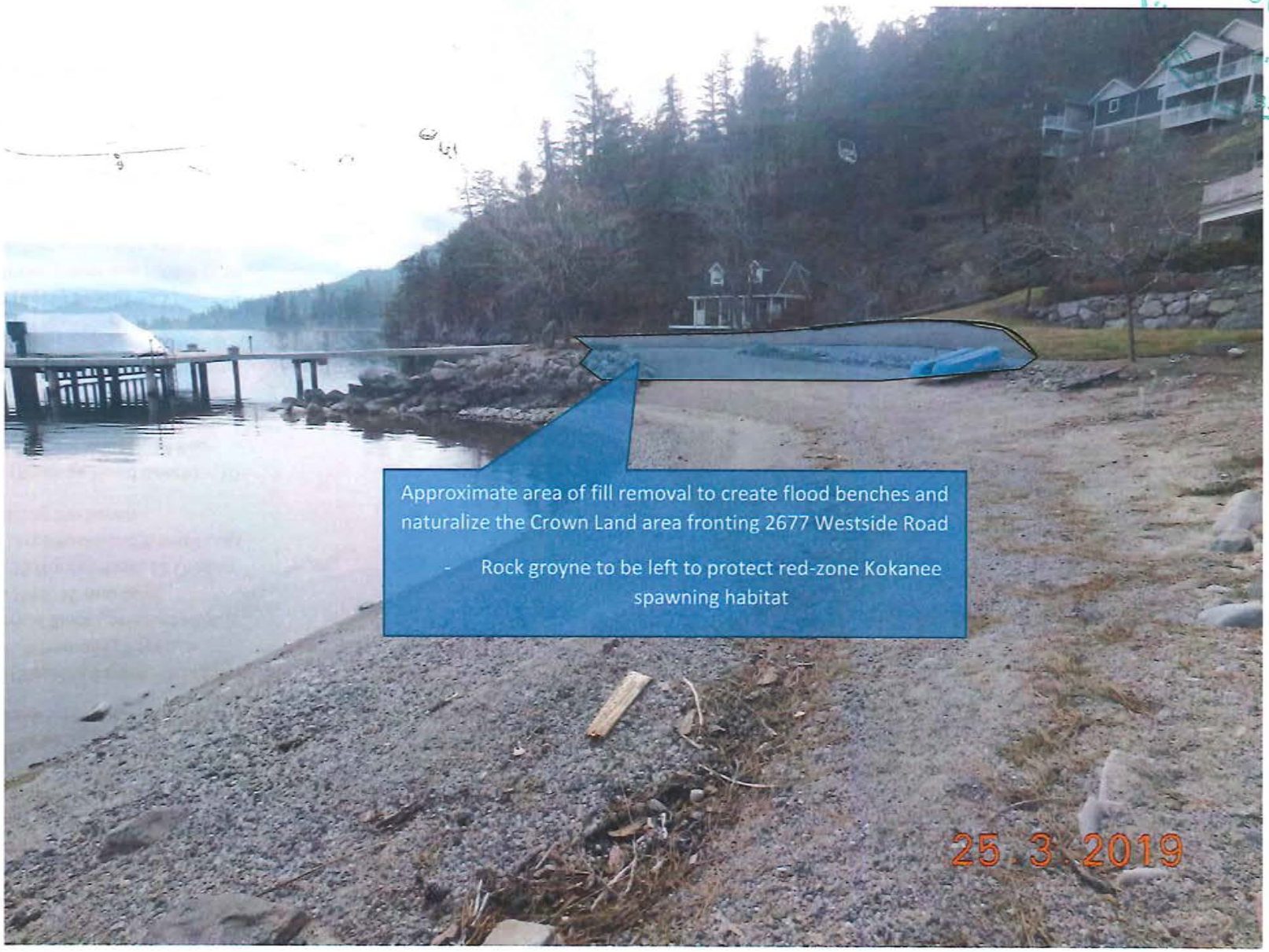
2677 Westside Road

Not to Scale




Arsenault Environmental Consulting Ltd. – 18 Dec. 2019

**Conceptual Grading Plan at 2677 Westside Road**

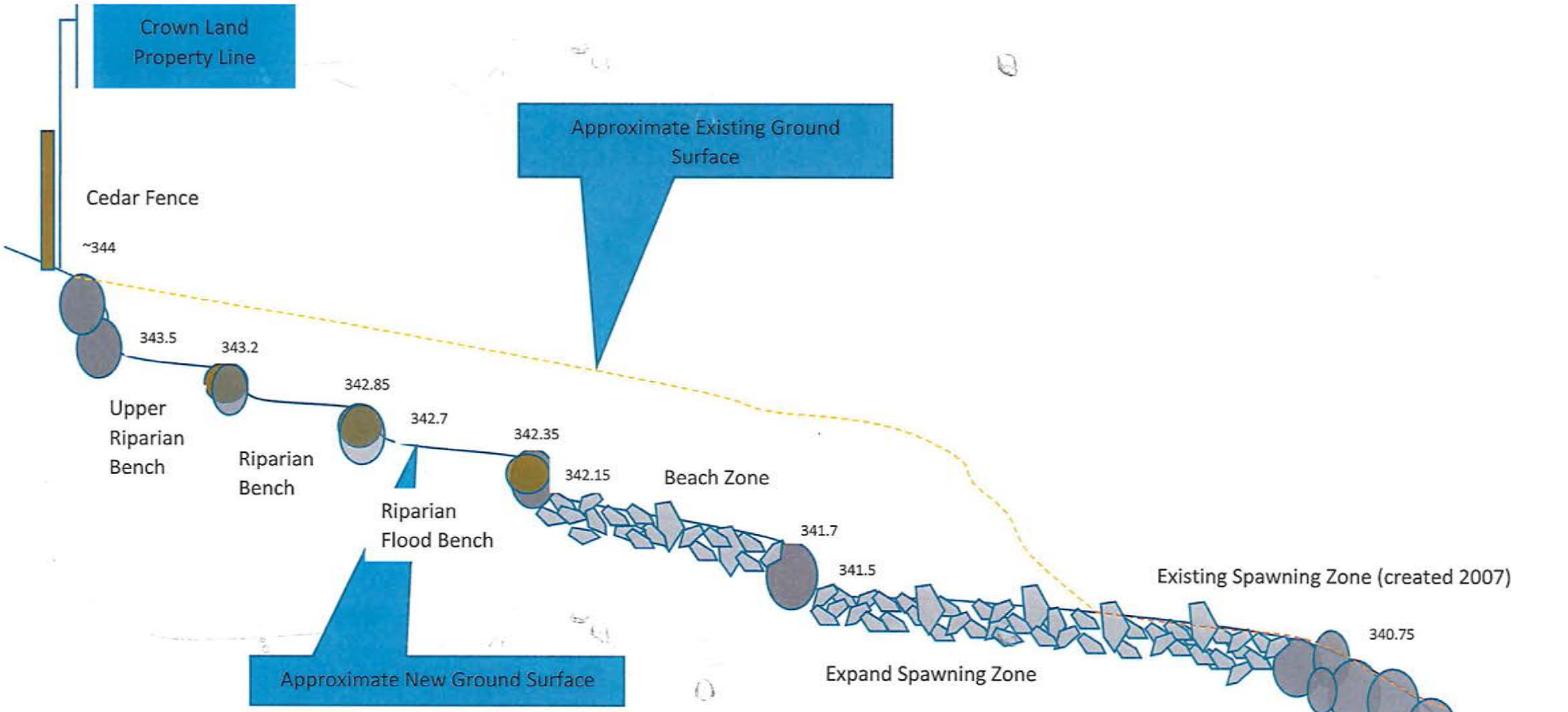





**Arsenault Environmental Consulting Ltd. – 17 December 2019**

# Fill Removal Grading Profile View

**- Crown Land Fronting 2677 Westside Road**






Not to Scale

Arsenault Environmental Consulting Ltd. – 18 Dec. 2019