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Fraser Valley Watershed Coalition
#1-45950 Cheam Avenue
Chilliwack, BC V2P 1N6

Attention: Natasha Cox, Program Director

Re: Planting Plan for Williams Phillips and Nancy Phillips Sloughs

1.0 INTRODUCTION

Under funding granted by Fisheries and Oceans Canada (DFO) through the Coastal Restoration Fund, Hemmera Envirochem Inc. (Hemmera), a wholly owned subsidiary of Ausenco Engineering Canada Inc. and the Sts'ailes First Nation (Sts'ailes) conducted fish habitat enhancement and restoration of William Phillips Slough and Nancy Phillips Slough (the "project"). The project was completed as part of the Heart of the Fraser Collaborative Partnership led by the Fraser Valley Watershed Coalition (FVWC) to improve access to existing off-channel rearing and over-wintering habitats.

The enhancement and restoration activities completed for the project are described in the Construction Plan / Environmental Management Plan (Hemmera 2019) and consist of the following:

- Excavation of new channel habitat upstream of existing channels;
- Excavation within the existing slough channels to lower the invert of the slough channels;
- Removal of existing obstacles to fish movement (e.g., beaver dam and reed canary grass (*Phalaris arundinacea*));
- Excavation of pool habitats and embayments; and
- Installation of rock weirs and large woody (LWD) debris structures.

The Post-construction Report for the project was prepared by Hemmera (Hemmera 2020) and provides a summary of the work completed as part of the project, including photo documentation and as-built drawings, which are attached in the **Appendix A**.

The riparian enhancement approach at the sloughs was determined following construction to evaluate the best sites to allocate the riparian funding resources associated with the project.

This letter report provides details regarding the following:

- Potential areas of riparian restoration associated with the William Phillips and Nancy Phillips sloughs.
- The planting to occur in 2020 to improve a portion of the areas identified above as per the funding received from Heart of the Fraser Collaborative Partnership.

2.0 RIPARIAN PLANTING APPROACH

The proposed riparian restoration at William Phillips and Nancy Phillips sloughs will be to restore areas that generally overlap with habitat disturbed by machine operation during the construction of the sloughs. The principal objective of this planting plan is to enhance fish habitat values associated with the riparian area attending William Phillips and Nancy Phillips sloughs, including soil stabilization, provision of shade, food and nutrients and plant biodiversity.

A key consideration that will influence the success of this planting plan will be selecting species that will thrive in areas currently dominated by invasive reed canary grass (*Phalaris arundinacea*) as it establishes quickly in disturbed habitat and can outcompete native vegetation. More details on reed canary grass life history and management is included in **Section 3.1** below.

3.0 EXISTING VEGETATION CONDITIONS

During a site visit on March 16, 2020, two Hemmera biologists inspected the sloughs to assess the as-built condition and identify suitable locations for restoration planting. The candidate locations for restoration planting are specified in as-built drawings (**Appendix A**) and documented in the Photo Log (**Appendix B**). A total area of ~3,500 m² was identified for restoration planting at both sloughs; ~1,350 m² and ~2,150 m² at the William Phillips Slough and Nancy Phillips Slough, respectively.

A list of the vegetation that was observed present in and around the William Phillips and Nancy Phillips Sloughs is included below in **Table 3.1**. At both slough habitats, the vegetation community nearest to the confluence of the Harrison River was predominantly low shrub species such as hardhack (*Spirea douglasii*) and reed canary grass growth was extensive. Farther inland up the slough habitats, the vegetation community becomes more complex with canopy cover present from species such as red alder, and conifers. The understory is also more complex with late successional stage plants present such as ferns, shade tolerant shrubs and immature conifers.

Table 3.1 Existing Riparian Vegetation at Nancy Phillips and William Phillips Sloughs

Common Name	Latin Name
Trees	
Black cottonwood	<i>Populus trichocarpa</i>
Red alder	<i>Alnus rubra</i>
Western hemlock	<i>Tsuga heterophylla</i>
Western red cedar	<i>Thuja plicata</i>

Common Name	Latin Name
Shrubs	
Pacific willow	<i>Salix lucida</i>
Salmonberry	<i>Rubus spectabilis</i>
Thimbleberry	<i>Rubus parviflorus</i>
Hardhack	<i>Spiraea douglasii</i>
Nootka rose	<i>Rosa nutkana</i>
Trailing blackberry	<i>Rubus ursinus</i>
Sword fern	<i>Polystichum munitum</i>
Herbs/grasses	
Reed canary grass	<i>Phalaris arundinacea</i>

3.1 Reed Canary Grass Life History and Management

Reed canary grass is an invasive perennial grass that is present throughout much of British Columbia's Lower Mainland and is prevalent in the Harrison River floodplain. Reed canary grass reduces species diversity in native ecosystems by quickly forming dense monocultures capable of shading out other species (WRCGM 2009). Reed canary grass is shade intolerant and is likely to demonstrate suppressed growth in shady conditions (Tu, 2004). Given these life history traits and the objective of this planting plan, species that establish well in disturbed sites and propagate quickly are recommended.

4.0 POTENTIAL AREAS OF RIPARIAN PLANTING

4.1 William Phillips Slough

There is a total of ~1,350 m² of riparian habitat at the William Phillips Slough that could be supplemented with riparian plantings to further enhance fish habitat values (see **Appendix A**). The adjacent riparian habitat at William Phillips Slough contains minimal canopy cover and extensive growth of reed canary grass (**Appendix B**); therefore, disturbed areas adjacent to the banks of the sloughs are providing minimal shade, food and nutrients inputs and have a lack of plant biodiversity. Given these factors, this area is a good candidate for riparian restoration associated with the project.

The southern planting area identified on the William Phillips slough has existing topsoil that will support the growth of a variety of plant species. The northern planting area on William Phillips Slough is lacking topsoil and substrate consists mostly of cobble which would restrict growth potential for plantings.

4.2 Nancy Phillips Slough

There is a total of ~2,150 m² of riparian habitat at the Nancy Phillips Slough that could be supplemented with riparian plantings to further enhance fish habitat values. The onsite conditions present at the slough include large deciduous and coniferous trees which provide canopy cover and an established understory community native of shrubs (**Appendix B**). The area on Nancy Phillips Slough that could be planted and would provide additional value to the habitat in the form of shading and inputs of food and nutrients would be the banks. Given the existing riparian habitat is providing value to fish habitat through shading and food and nutrients inputs, this area is a lower priority to allocate resources to.

The substrate present at Nancy Phillip slough contains topsoil on the southern banks of the slough however on the northern banks and above the top of bank the majority of the substrate is cobble which would restrict growth potential from plantings.

5.0 PLANTING PLAN

The following planting plan was generated in consideration of the riparian habitat values present at both sloughs and the best allocation resources to increase value to fish habitat. Given these considerations, the William Phillips Slough has the best justification for the majority of the riparian restoration funding allocation; therefore, the following planting plan was focused on the restoration of riparian habitat at this slough.

The following planting plan methodology was developed based on the following guidance documents:

- Guidance for Restoration Activities in Riparian Areas (Stewardship Center for British Columbia 2013).
- Riparian Restoration Guidelines (Ministry of Environment 2008).
- Riparian Revegetation (DFO n.d.).

To ensure that restoration planting is successful, it is recommended that planting occurs in either fall or spring. Prior to planting the following steps should be taken to prep the sites:

- Retain healthy native trees and ensure protection of root zones of existing trees.
- A recommended minimum topsoil depth of 0.30 m is for planting success is recommended in areas that are currently lacking topsoil. If topsoil is imported, it should be certified free of noxious invasive plant species. Topsoil from slough excavation activities may be used if the QEP overseeing work deems the soil appropriate.

Recommended native species for planting in the restoration area is provided in **Table 5.1¹** and have been tailored to reflect the habitat conditions present and high propagation rate. The approach to planting in this area that was recommended by FVWC was to plant a high density (greater than 1 plant per m²) of small plantings (i.e. plugs, live stakes or #1 pot size) as there is likely to be high fatality rates due to reed canary grass competition. Given this feedback, plantings will be installed at a density of 1.5 plants/m². Given budgetary constraints a total of approximately 750 m² of this habitat can be planted within the allocated budget.

¹ Subject to availability. Substitutions may be made if approved by the QEP.

Table 5.1 Planting Prescription for William Phillips Slough

Common Name	Latin Name	Plant Size	Number of Plants
Trees			
Red alder	<i>Alnus rubra</i>	#1 Pot	300
Shrubs			
Hookers Willow	<i>Salix hookeriana</i>	Live stake	400
Pacific Willow	<i>Salix lucida</i>	Live stake	400
Total			1,100

Given site and budgetary constraints weighed with the fish habitat values present at both the William Phillips slough and Nancy Phillips slough, only the William Phillips slough is recommended to be planted with the allocated funds. For areas that cannot be planted at this time due to budgetary constraints it is recommended that they be seeded with red clover seed mix to help support nitrogen fixing, stabilize the banks and prevent extensive colonization of reed canary grass.

6.0 RIPARIAN PLANTING MONITORING AND MAINTENANCE

If possible, the planted areas should be monitored once per year over a three-year period to ensure that remedial measures are not necessary. If remedial measures are found to be necessary (e.g., removal of invasive species or supplemental plantings). In addition, watering the plantings for the first two years following installation would likely be beneficial to ensure their establishment. This may not be feasible given the project location and access considerations.

7.0 CLOSURE

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.

Stephanie Cavaghan, BIT
 Project Manager

Report reviewed by:
Hemmera Envirochem Inc.

Trevor Welton, R.P.Bio.
 Vice President BC/YK

8.0 REFERENCES

Fisheries and Oceans Canada (DFO). N.d. Riparian Revegetation. Accessed March 2020. Available at <http://www.dfo-mpo.gc.ca/Library/315523.pdf>

Hemmera. 2020. William Phillips and Nancy Phillips Slough Post Construction Report. March 2020.

Ministry of Environment. 2008. Riparian Restoration Guidelines. Accessed March 2020. Available at: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/riparian-areas-regulation>

Tu, M. 2004. Reed Canarygrass (*Phalaris arundinacea* L.): Control & Management in the Pacific Northwest. The Nature Conservancy, Oregon Field Office.

Wisconsin Reed Canary Grass Management Working Group (WRCGM). 2009. Reed canary grass (*Phalaris arundinacea*) Management Guide: Recommendations for Landowners and Restoration Professionals. Accessed March 2020. Available at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_035064.pdf

APPENDIX A

As-built Drawing

**William and Nancy Phillips Slough
As-built Drawing**



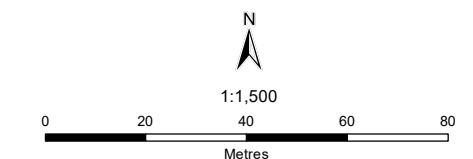
- Legend**
- Rock Weir
 - Large Woody Debris
 - Access Road
 - Existing (Approximate Area: 1,946 m²)
 - Enhance (Approximate Area: 726 m²)
 - New (Approximate Total Area: 1,916 m²)
 - Nancy Phillips Slough Approximate Area: 1,486 m²
 - William Phillips Slough Approximate Area: 430 m²
 - Riparian Planting (Approximate Area: 3,483 m²)
 - New Riparian Area (Approximate Area: 7,615 m²)

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licence - Province of British Columbia
- Orthoimagery at 15 cm resolution.
- Inset Basemap: ESRI World Topographic Map



NAD 1983 UTM Zone 10N
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For Discussion Purposes Only

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APPENDIX B

Photo Log

William Phillips Slough Planting Areas



Photo 1 March 16, 2020 – North facing view of riparian restoration area on William Phillips Slough (right bank)



Photo 2 March 16, 2020 – South facing view of riparian restoration area on William Phillips Slough (right bank)



Photo 3 March 16, 2020 – North facing view of riparian restoration area on William Phillips Slough (right bank).

Nancy Phillips Slough Planting Areas



Photo 4 March 16, 2020 – Example of riparian restoration area on Nancy Phillips Slough



Photo 5 March 16, 2020 – Example of riparian restoration area on Nancy Phillips Slough



Photo 6 November 7, 2019 - North view of planting area at Nancy Williams Slough.