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# Squamish Estuary / Mamquam Blind Channel Restorations 2007/2008 Final Report

**Project Number 07.CMS.01**

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10th Anniversary
1998-2008

**With financial support from:**
**BC Hydro**
**Bridge Coastal Fish and Wildlife Restoration Program**
**6911 Southpoint Drive E16**
**Burnaby, B.C.**
**V3N 4X8**

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## *EXECUTIVE SUMMARY*

This years funding was directed at completing the works initiated last year in Site 'A' with the installation of a culvert across the WestBarr Log Sort Road opening the tidal slough between the Central Estuary and the Spur Line. The final riparian vegetation planting was the extension included in the year's works. A second stage of this years project works included adding additional culverts into the Squamish Training Dyke. Three 48" steel pipes were installed within the Windsurfing Spit section of the Training Dyke allowing river water to exchange with the Central Estuary. The final component of this year's work was to revitalize the Britannia Slough which has been isolated by Highway 99 and urban development within Dentville.

Britannia Slough provides a year round tidally influenced flow of low oxygenated, poor quality water into the Mamquam Blind Channel. A trail network constructed in partnership with the District of Squamish and the Squamish Trails Society in the late 1990's (the Discovery Trail) traverses this site and through neglect and poor habitat conditions the riparian vegetation and understory have become severely impacted. The intent of this project was to improve water quality, fisheries and wildlife habitat and to provide a productive natural environment to enhance the Discovery Trail network.

Peter Kiewit and Sons installed a 6' concrete box culvert at the northern end of the Britannia Slough in November of 2006 allowing river flows from the Mamquam River to enter once again into this system. A second concrete box culvert is proposed to be installed in late summer of 2008 to complete the circuit, reconnecting the lower end of Britannia Slough with the tidal waters of the Mamquam Blind Channel.

In order to maximize on habitat and habitat values it was necessary to improve the Britannia Tidal Slough by deepening it by approximately one metre and installing woody debris (refuge habitat for salmon fry and other fish species) as well as planting native vegetation within the riparian zone to provide shelter, shading, and a food source for wildlife. A further benefit is the improvements to the walking trail (which has become fairly dismal) by sprucing up the surroundings with native vegetation. This area is adjacent to the Squamish Elementary and Howe Sound Secondary Schools as well as Capilano College. Educational outreach programs are already in place to engage students in educational opportunities to learn more about the natural environments adjacent to their learning centres.

The Britannia Slough is an important waterway for numerous fish species including coho, chum, and pink salmon, cutthroat trout, herring, Dolly Varden and steelhead as well as numerous non sports fisheries species (sculpins, stickleback, lamprey, etc). The wildlife values include improving habitat for deer, otter, mink, bear and numerous other mammals. The usage of this area by avian populations has been long studied during the monthly bird counts by the Squamish Environmental Conservation Society and this area provides an important corridor for resident and migratory birds.

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## 1. Introduction

The site is located in the East Delta of the Squamish River approximately 8.0 km. downstream of the Squamish-Cheakamus confluence. The property is designated District Lot 486, Group 1, in the New Westminster Land District. Maps covering the site are Natural Resources Canada National Topographic System 92G/11 and Geo Data British Columbia Terrain Resource Information Management 92G.065 near UTM coordinates of 5505270m N by 488150m E (1983 North American Datum, UTM Zone 10U) or BC Albers coordinates 1204580m, 524500m.

The area is composed of historic channels of the Mamquam River that are currently tidal sloughs, both active and inactive, feeding into upper Howe Sound through the Mamquam Blind Channel. All of these areas are within tidal influence and salinity ranges from freshwater to 18/1000 salinity over the course of the year dependant on Squamish River discharges. The estuary vegetative community ranges from salt water tolerant marine algae such as rock weed to shrubs and trees common to brackish estuaries such as Sitka spruce and twin berry. Much of the area is covered with an understory of shrubs, herbs and trees. The tidal channels have bottom inverts near 0.0 meters and bank elevations of 1.3 meters geodetic. The larger tides reach the upper ends of Britannia Slough only periodically due to poor circulation and constriction across Highway 99. Ideally, tidal channels provide an accessible path for fish to penetrate deep into the upper slough providing a low tide refuge area where both fish and their various prey items can survive during the low water periods.

This phase of the project involved restoring and improving Britannia Slough, which has been isolated by highway and railway corridors for the past 80 years. The tidal channel, that has not supported juvenile salmonids for decades, will once more provide high quality rearing habitats for coho and chinook salmon juveniles throughout the year.

A new culvert was installed across the Vancouver-Whistler Highway 99 corridor into the upper north end of Britannia & Wilson Slough just south of the Industrial Park (refer to Section 3 for location details). A second culvert crossing of Highway 99 is proposed for later in the year that will re-connect the eastern and western tidal portions of the Loggers Lane Creek / Mamquam Blind Channel watershed (the Mamquam Reunion project). Peter Kiewit and Sons has funded both of these culvert crossings that have been specifically designed as an enhancement legacy of the highway project. The culvert crossings complement the Mamquam River floodplain and Squamish Estuary restoration works supported by BCRP over the years.

The CN railway corridor, which isolates the Mamquam Blind Channel from the central Squamish River estuary, has been breached by a new water control structure allowing rearing salmonids full use of both habitats by the spring of 2008. The proponents of both those projects will be expending in excess of $300,000 in early 2008. In 2008 two other undersized culverts on

the Mamquam Blind Channel, will be replaced and their inverts lowered by Peter Kiewit and Sons to improve fish access and tidal flows. These projects will have a value of approximately $450,000 and be an additional contribution to the overall Squamish River Estuary and Mamquam River floodplain restoration effort.

The 2007 contribution from BCRP allows further restoration of the tidal habitats adjacent to these two new structures taking advantage of the newly accessible habitats. The result is to provide good habitat for juvenile chinook, coho, chum and pink salmon during their freshwater rearing phase.

## 2. Goals and Objectives

The primary goals were to:

- Produce upwards of 4,500 $m^2$ of tidal channel and rearing habitat;
- Replant marsh and riparian vegetation in the newly constructed habitat areas;
- Provide up to date mapping of the watercourses and restoration sites;
- Improve fish access across the Squamish Training Dyke through culvert installations; and
- Complete the vegetation management on the previous years Site “A” tidal channel connection.

The primary objective of this year’s funding was to improve salmonid habitat (primarily chinook, coho, and steelhead fry rearing habitat) by deepening the Britannia Slough Tidal Channel increasing tidal flush. With the addition of two box culverts, one at the upper end, one at the lower installed by Peter Kiewit and Sons, the Britannia Slough once again is accessible to salmonids and other species.

The habitat improvements also benefit migratory and residential avian populations as well as other local wildlife (including red legged frogs, beavers, otters, and deer). Care was taken to replant the disturbed site with native trees and shrubs.

As well, the first part of this year's funds were directed at vegetation management of the riparian area around the Site "A" tidal channel installed last year. Over 500 native trees and shrubs were planted along the new channel and trail walk way (above photos).


The second part of this year's funding went towards installing additional culverts in the Training Dyke (along the Windsurfers Spit). Three new 48" steel culverts were installed making a total of 10 culvert connections between the Squamish River and Central Estuary (photo to right).

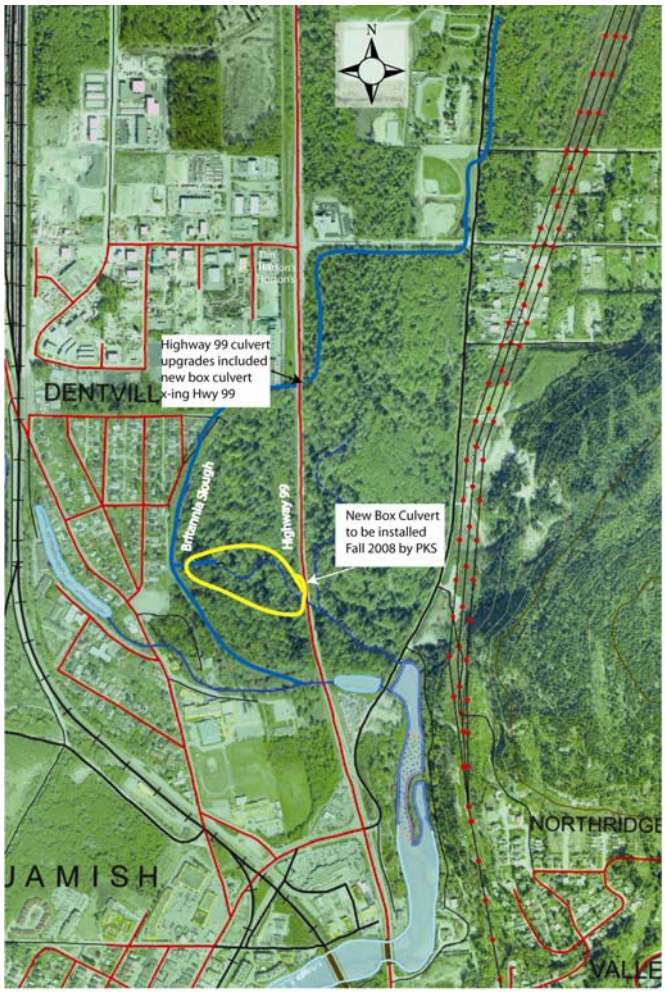
As the culvert installations and the vegetation management of Site "A' are continuations of previous year's funding works this report will concentrate on the new section, the revitalization of the Britannia Slough Tidal Channel.

An additional component of this year's works included the upgrading of seven of the bridges along the North Loop Trail in Site "A'. With the approval of Squamish Nation, the Squamish Trails Society organized a volunteer trail repair day (April 6, 2008). Over a dozen volunteers came to assist Carl Halvorson (who had measured and precut each and every bridge) to install the bridges one by one. The end result has been accolades from the community on improving the safety of this route. As an additional note, on April 19, 2008, as part of the ceremony and announcement by the Ministry of Environment of the new Wildlife Management Area and Plan, Barry Penner (Minister of Environment), Chief Gibby Jacob, and local MLA Joan McIntyre, were taken along the newly constructed bridges along the trail by Randall Lewis and Edith Tobe.

Before and After views of one of the bridges

## 3. Study Area

The Britannia Slough is located on the west side of Highway 99 sandwiched between McDonald's (to the south) and the Industrial Park (to the north). This slough receives storm water surface drainage from the Industrial Park and Dentville (the community to the west of the slough). As such, the water quality over the years has been declining. The poor water quality, combined with a high iron precipitate in the subsurface soils have further degraded the water quality resulting in low DO algal infested pools of semi-tidal water. The addition of culverts at the upper and lower ends connecting the Britannia Slough once again with consistent fresh water flows from the Mamquam River (via Loggers Lane Creek restoration efforts) now allows tidal ebb and flow.



Area in yellow identifies current Britannia Slough Tidal Upgrades (works being undertaken in March 2008)

As a result of the site being tidal, at low flows the inflow will now primarily comes from the east across Highway 99 to provide well oxygenated waters from the Mamquam River and the Mamquam Blind Channel. However, at high tides and high flows, the Britannia Slough will provide an important storage area for Dentville but overflow will cross to the east across Highway 99 into the larger flood storage lands of the Loggers Lane / Mamquam Blind Channel.

## 4. Methods

The project involved the placement of between 100 – 150 large woody debris (root wads, trees, stumps) into the section of the Mamquam Blind Channel known as the Britannia Slough. As well, boulder clusters and weirs were installed. Fisheries and Oceans Canada provided the engineering design and drawings for lowering the Slough invert by one metre and grading the slopes back on the north bank in a 2:1 slope. The south bank, for the most part, was left in tact. The entire slough was widened to no more than three metres at the top of

bank (approximately 1.5m – 2m along the invert). Fisheries and Oceans Habitat Biologist, along with the Project Manager developed a vegetation management plan that included over 2,500 native trees and shrubs to be reintroduced along the slopes and top of bank. Several aquatic species were also planted along the slough benches.

In advance of the construction works, the public was notified by handouts delivered to the neighbouring homes within 0.5km of the worksite. The District of Squamish was also notified of the construction schedule and a general e-mail was circulated around town.

The works fit within the recently completed flood hazard study by HayCo commissioned by the District of Squamish. The District of Squamish recognized and supported the merits of this project in assisting in alleviating flood hazard issues in the area.

## 5. Results

The project results included:

- 390 linear metres of revitalized tidal channel or 3,900 square metres of new habitat;
- 135 LWD placements along the length of the channel (much recruited from the actual site);
- 2,400 trees, shrubs, and wetland plants (including grass seeding the site) along the Britannia Site;
- 500 trees and shrubs along the new tidal channel of Site ‘A’;
- 7 upgraded bridge crossings (a total of 120’) along the North Loop Trail in Site ‘A’;
- Public engagement and support;
- Reconnecting the western arm of the Mamquam Blind Channel and reestablishing tidal influence from the Central Estuary and Howe Sound;
- 4 gravel weirs to regulate flows.

Prior to the works being initiated the area was sampled for fish presence. Only a few stickleback were noted within the entire Britannia Slough system. In the fall of 2008 this sampling will be repeated (by DFO and SRWS staff) and the results will be made available to BCRP staff.

Follow up monitoring on how the site is functioning, the status of the vegetation management, and improvements to the habitat (including bird usage) will also be studied and reported upon.

Works begin at eastern end towards Highway 99 on north side of slough


Clearing the site (the LWD to be used later as seen on right photo)


New tidal slough (left photo facing east towards Highway 99 and right photo facing west, away from Highway 99 – note effort to preserve natural conifer stands)

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Pictures taken of the tidal channel prior to excavation works


More photos before works commence

Tidal Slough after being deepened


Access cordon across easternmost branch by Dentville (all access was removed at the end of the project)

## 6. Discussion

The history of the area that lies within the Mamquam Blind Channel includes massive flooding in 1921 of the Mamquam River redirecting it from the original route along the Blind Channel into Howe Sound to it's present course westerly into Squamish River. Industrial uses including logging and power plant operations (along the upper Mamquam River), urbanization and flood dyke construction, as well as green space and fish spawning channels also make up the characterization of this area.

The Britannia Slough tidal revitalizations has resulted in extensive partnerships and support including the District of Squamish, Squamish Nation, Fisheries and Oceans Canada, Ministry of Environment, Squamish Streamkeepers, Squamish Environmental Conservation Society, Squamish Trails Society, Capilano College, and School District 48. The District of Squamish members of Council have been speaking about improving the quality of water and habitat on the Britannia Slough for over 3 changes of council since the concept was first brought in 1998. This is an important project as acknowledged many times over the years to the community of Squamish.

As the waterways become fish friendly, as the water quality improves and people begin to recognize the value of these lands the community itself is slowly changing as well. Developers are approaching the Watershed Society and engaging proactive management of the water resources and natural habitat. The residents and members of the community for the first time in decades are arguing over water access routes as they desire access to these improved new habitats. And the District of Squamish and Squamish Nation have become increasingly interested in purchasing lands as they become available along the Mamquam Blind Channel.

All of these social changes can be attributed to these projects that have been funded over the past decade through the Bridge Coastal Fish and Wildlife Restoration Program. We sincerely hope to be able to continue with these good works well into the next decade.

## 7. Recommendations

The recommendations are to continue to reconnect the isolated channels within this portion of the estuary and to establish permanent interpretive signage. Squamish Nation has begun a pilot project to place educational signage at specific fishing sites. The hope is to incorporate this style of signs in the estuary. Furthermore, the estuary is becoming an increasingly important destination for pedestrian traffic and residents and visitors and looking for nature hikes and peaceful sites to visit. The tidal salmon channels help to provide such a destination and are being well received by the community as a whole.

## 8. Acknowledgements

This phase of the project was undertaken in direct partnership with Squamish Nation for the section within the land parcel known as “Site A” (land areas located to the north of the “North Loop Trail” on the attached map). Squamish Nation has been an active participant in the previous alignment and construction of the initial channels on the adjacent “South Loop Trail” portion of the Wildlife Management Area. The Watershed Society and Fisheries and Oceans have met on-site with Randall Lewis of Squamish Nation and will be bringing the proposed plans and alignment to the attention of Squamish Nation Council for their final input and approval. Historically, the channels that are being restored were not just important habitat for juvenile chinook and other salmonid species but were also an integral water way for the original inhabitants of these region and the channel construction and placement is being undertaken to allow accessible navigatable waters in this area.

We would like to thank BC Hydro Bridge Coastal Fish and Wildlife Restoration Program for all of their help and assistance is funding and supporting the tidal channel and marsh restoration project.

We would also like to take this time to thank:

- Randall Lewis, Squamish Nation,
- Matt Foy, Harold Beardmore, Fisheries and Oceans Canada, for all of their hard work, and finally
- John Hunter Company Limited for their superb work, once again, for their care and effort while working within such sensitive areas.

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