

SQUAMISH RIVER WATERSHED
SOCIETY

Box 1791
Squamish, BC
V8B 0B3

**Squamish River Estuary Training Dyke
Culvert Improvement Project**

Prepared by:
Squamish River Watershed Society
Box 1791
Squamish, B.C.
V08B 0B3

With financial support from:
CN
Cheakamus Ecosystem Recovery Fund
13477 116 Avenue
Surrey, BC, V3W 6W4

May 16, 2008



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Section A PROPONENT INFORMATION

Organization: Squamish River Watershed Society

Project Manager: Edith B. Tobe Title: Executive Director

Address: Box 1791, Squamish, BC, V8B 0B3 (Courier: 41820 Rayburn Road, Brackendale)

Phone: 604-898-9171 Cell: Fax: 604-898-9161

Email: SRWS@shaw.ca Website: www.squamishstreams.com

List of Subcontractors and contact information:

[John Hunter Company Limited, Box 55, Squamish, BC](#)

Section B PROJECT INTRODUCTION

Project Title: Squamish River Estuary Training Dyke Culvert Improvement Project

Project Location: (provide civic address, river km, or identify nearby landmarks):

The site is 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.

Project Activity

Habitat Rehabilitation	X
Stock Enhancement	
Habitat Assessment	
Stock Assessment	
Education & Awareness	
Stewardship/Community Planning	
Other (Specify)	

Species targeted by or benefiting from project activities:

[Chinook, coho, chum, pink, steelhead, cutthroat, herring](#)

Is this project a result of a previous CN Project: YES NO

Amount Requested: \$59,550

Total Project Value: \$116,848

Project Start Date: June 2007

Project End Date: May 2008



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Section C PROJECT DESCRIPTION

Provide a brief overview of the project: (Describe the relevance and significance to Cheakamus ecosystem recovery. How does this project address the sustainability or rebuilding of the target species, what limiting factors does this project address.)

In 1971 a Training Dyke was constructed along the eastern bank of the Squamish River confining it to the western boundary against the Tantalus Mountain Range in an attempt at the time by BC Rail to convert this section of the estuary into a major port for ocean going ships. In 1972, Fisheries and Oceans and Environment Canada, intervened and over the last thirty years, the idea of developing this section of the estuary has been abandoned and it is now contained within a Wildlife Management Area and conserved for use by fish and wildlife.

The result of the early dyke construction was that the entire 4 km length of the lower Squamish River had no direct connection to the eastern portion of its historic estuary. The dyke denied easy and direct access by salmonid juveniles and other species, to important estuarine habitats that were critical for early growth and survival of young fish. Chinook salmon juveniles in particular need estuary habitat to thrive when they enter saltwater habitats from their parent streams in the spring.

From 1994 until 1999, DFO with the Squamish River Watershed Society and its partners installed a series of seven culverts through the upstream section of the training dyke that permitted the waters of the Squamish River to once again flow in and out of the central and eastern estuary. The uppermost culvert was located near the top of the Squamish River estuary delta and the lowermost culvert was located at the foreshore of the delta front. No culverts were located any farther seaward as the option of removing a large section of the ocean training dyke from the near shore habitats was being considered at the time. It has been decided as of 2006 to not remove any portion of the sea training dyke that bisects the near shore waters of the Squamish river estuary due to conflicts with other interests in the area. The previously installed culverts (all seven of them) are all functioning and are maintained and monitored on a regular basis (several times a year for monitoring and as needed for maintenance) by DFO and the SRWS.

Given the dyke will remain, there was recognition of a high restoration potential for installing an additional three culverts at strategic locations to maximize the opportunity for juvenile fish passage through the sea training dyke as it crosses the near shore section of the Squamish river estuary.

Following the sodium hydroxide spill in 2005 it became increasingly imperative to maximize access to estuary habitat that is vital to salmonid smolt growth and in particularly important to the health and restoration of Chinook salmon populations in the watershed.

The first limiting factor that was addressed was the loss of access to estuary rearing and off channel habitats important to species such as Chinook salmon. Estuary channels provide excellent rearing habitat for Chinook fry in their first and second years. C. Melville pers. comm. reports that over 95% of the Chinook juveniles captured migrating out of the Cheakamus River in the spring of 2000 were first year fry. These Chinook fry would require at least 3 months of rearing in habitats downstream of the Cheakamus River prior to their entry into saltwater. The Squamish River estuary and its tidal channels provide a significant amount of this critical Chinook rearing habitat for the Cheakamus River Chinook populations. Without adequate culvert connections between the Squamish River and the inner estuary delta the access is severely limited for fish passage. The section that was targeted for the CERF program was without any culvert crossings for the entire 700m length. The three culverts were placed approximately 250m south of the last culvert installed at the yellow gate entrance to the Windsurfing Dyke and spaced 100m apart.

The second limiting factor addressed was the probable decrease in Chinook fry growth rate due to reduced water temperatures that result from flow diversion at Daisy Lake and the dominance of Rubble and Culliton Creek in defining summer temperatures in the lower Cheakamus River. Decrease in spring and summer water temperatures has presumably reduced the potential growth rates and productivity of Chinook fry residing in the Cheakamus River. A large component of the Chinook salmon fry produced from spawning grounds on the



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Cheakamus River leave the river soon after emergence and rear and feed in the mainstem Squamish and its estuary channels for some months prior to their migration into Howe Sound. The freshwater rearing corridor for Cheakamus River Chinook juveniles begins in the Cheakamus River canyon and extends downstream along the Cheakamus-Squamish River corridor and ends in the Squamish River estuary where Cheakamus River Chinook reside prior to their entry to Howe Sound. By improving Cheakamus River Chinook fry and smolt access to and use of the warm, nutrient rich waters of the Squamish River estuary their overall productivity and survival would be expected to increase. The new access into estuary habitat is expected to compensate for some of the Chinook productivity losses in the Cheakamus River.

Incidental benefits are also expected for other species of interest including lamprey, sculpins, herring, stickleback, steelhead trout, pink salmon, cutthroat trout, coho salmon, Bull Trout and coho salmon from the Cheakamus River watershed which may spend varying periods of time in the Squamish river estuary during their life cycle.

What species, life stage does this project target:

Chinook, coho, chum, pink, smolt & fry stage; cutthroat Bull and steelhead trout adult and fry; sculpins, herring, lamprey, stickleback.

Describe the specific objectives of this project and if they were achieved or an explanation if they were not: (Specific, Measurable, Achievable, Realistic and Time Bound)

Objective # 1 Install three 36.5 m x 1.2 m culvert crossings at the lower end of the Training Dyke/Windsurfing spit spaced 100m between each other. The overall increase of estuary habitat to migratory salmonids and other fish cannot be determined, but the central estuary is once again that much more accessible through these three new connections. (Please be aware that the original application was for one culvert crossing but as a result of obtaining CERF funding the SRWS was able to raise an equal amount from other funding sources to increase the culvert installations to three crossings).

Objective # 2 Effective monitoring on the benefits of the culvert installation – this will begin in the fall with seine netting by DFO and SRWS staff. Monitoring report updates will be provided to CN on an ongoing basis

Objective # 3 Media attention through a local volunteer group such as Streamkeepers – there has been much attention given to these culvert installations and during the summer there will be several articles in both the Pique and the Chief highlighting the success of this type of project; In May 2008 the Education Outreach program will be bringing over 300 elementary school children (grades 4 – 7) to this area as part of their program and the newly installed culverts will also be highlighted to the classes.

Describe methods, including environmental protection, timing, site and post project monitoring and reporting plans, triggers and responses for adaptive management:

Three 36.5 m x 1.2 diameter steel culverts were installed during the daytime when tides and river flows were suitable between March and May 2008. The installation took place in the off-season for windsports and during the winter months when the flow from the Squamish River is low. Ideally the culverts should have been installed during the winter months prior to the Chinook fry outmigration but the timing became impractical as no suitable dates could be established due to inclement weather. The result was an early spring construction window. As in the past, all proper silt control measures were employed, installing the pipe at low tide, diverting all water around the site so that the culverts may be installed “in the dry”, and coordinating efforts through the District of Squamish so as not to impeded pedestrian access down the Training Dyke during the actual construction and installation. Notification was placed at the entranceway to the Windsurfing Spit notifying the public of the upcoming construction schedule. The Squamish Windsports Society and the District of Squamish were notified in advance of each of the three culvert installations.

The culverts were each installed in the same manner as the past culvert installations. The culvert invert was –1.0 geodetic. As the Training Dyke is not a flood control dyke, the bedding was crush with the fill material compacted



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over top and the final grading being undertaken over the site. The culvert was welded together so that the full length culvert was installed. Through DFO and the SRWS, an environmental monitor was on site during the operations and the contractor, John Hunter & Co. had all the necessary precautions and equipment as certified and approved for works within a sensitive wetland habitat. No incidental difficulties arose. The long term monitoring will be undertaken by DFO and the SRWS and will include ensuring the exchange of flow between the estuary and river waters, and that the culverts remain unhindered. Maintenance will be undertaken as required to provide proper functioning. Periodic fry sampling adjacent to the installed culvert will be taken annually by DFO or the SRWS. As noted, all construction was performed by John Hunter and Company with suitable machinery that is certified for sensitive wetland habitat works (containing all oil collectors).

**Provide design drawings and a description of the techniques and methods being used (if appropriate)
Figure 1 (attached)**

If required, has the design been approved by a Professional Engineer and/or Biologist? YES NO
Harold Beardmore, P.E.Eng, DFO; Matt Foy, Biologist, DFO; Edith Tobe, RPBio, SRWS

Is this project utilizing recognized or emerging technologies? YES NO

If so please provide supporting argument for its selection:

Will this project require long-term maintenance? YES NO

If yes, what are the anticipated annual costs? \$2,000 - \$5,000

Who will fund it?

These costs will be covered by DFO staff along with SRWS staff to undertake effectiveness monitoring, seine net trapping, and all other monitoring (D.O., invertebrate sampling, etc). Long term monitoring includes visual inspections, removal of any obstructions, and photopoint monitoring all of which will be undertaken in partnership between the SRWS professional biologist and DFO qualified staff (engineering and habitat biologist).

Section D PROJECT SUPPORT

Please check which relevant government agencies, First Nations, and authorities have reviewed this proposal and given letters of support to ensure compliance with current and emerging policy, to reduce redundancy and duplication of similar works and to create opportunities for leveraging and partnerships:

	Reviewed	Letter of Support	Contact Name
Fisheries and Oceans Canada	<input checked="" type="checkbox"/> / N	Y / N	Matt Foy
Ministry of Environment	<input checked="" type="checkbox"/> / N	Y / N	Steve Rochetta
Squamish Nation	<input checked="" type="checkbox"/> / N	Y / N	Randall Lewis
District of Squamish	<input checked="" type="checkbox"/> / N	Y / N	Doug French
Squamish Lillooet Regional District	Y / N	Y / N	N/A
Other: _____	Y / N	Y / N	



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Section E PERFORMANCE EXPECTATIONS

MEASURES OF SUCCESS

Describe any specific objective standards, quantifiable criteria and quality control measures that will be used to assess the actual performance of this project against expectations. Provide a monitoring and evaluation plan that is appropriate and achievable for quantifying fish benefits:

MILESTONES

Break the project into discrete sequential tasks, and provide the expected task completion dates

Purchase of Culverts	November 2007
Culvert Installation	March – May 2008
Site Clean-up	March – May 2008
Signage and Public Outreach/communication	Summer 2008

Section F Education/Awareness/Stewardship

List any education and awareness components of this project. What group did it target? (Preschool, Grade K-12, Adult). List meetings, tours, interviews etc.

School District 48 is working with the Squamish River Watershed Society and educational consultant D.G. Blair-Whitehead (of Whitehead Environmental) on an outdoor educational program for grades 4 – 7 at the elementary schools. The school classes will be viewing ocean conditions and the importance of estuaries near to the site of the proposed culvert crossings and the project can be incorporated into the curriculum including the opportunity for some riparian plantings and education. The Education Outreach program is being funded through CERF and will engage the school children in an understanding of the river and estuary dynamics and how the culverts have improved fish passage.

The local media is very interested in this project and is planning to publish an article in both the Chief and the Pique later in the spring or early summer. Information on this project will be updated onto the www.squamishstreams.com website (maintained by SRWS).



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Section G BUDGET INFORMATION

LABOUR

Service	# of People	Daily Rate	Total # of Days	Total Cost	CN Contribution	Other Funding or In-Kind contributions
Professional Engineer		\$500.00	5	\$2500.00		\$2500.00
Professional Biologist		\$500.00	8	\$4000.00		\$4000.00
Project Manager		\$498.75	8	\$3990.00	\$2992.50	\$997.50
(A) LABOUR COST TOTAL:				\$10490.00	\$2992.50	\$7497.50

MATERIALS & EQUIPMENT

Item	Details	# of Units	Total Cost	CN Contributi	Other Funding or In-Kind contributions
Culvert	48"	3 x 36.6m	\$46939.20	\$46939.20	
Freight			\$1942.50	\$1942.50	
Heavy Equipment	Excavators, Dump Trucks, Steam Rollers, etc	15 days	\$43628.30	\$4777.81	\$38850.49; DFO, BCRP
Welding			\$1848.00	\$1848.00	
Rock			\$10000.00		\$10000; MoTH
(B) MATERIALS & EQUIPMENT COST TOTAL:			\$104358.00	\$55507.51	\$48850.49

ADMINISTRATION AND OVERHEAD COSTS

Item	# of Units	Unit Cost	Total Cost	CN Contribution	Other Funding or In-Kind contributions
Supplies (ink, paper etc)			\$500.00	\$250.00	\$250.00
Office Rental			\$1000.00	\$500.00	\$500.00
phone fax			\$500.00	\$250.00	\$250.00
(C) ADMINISTRATION & OVERHEAD COSTS TOTAL: \$2000.00				\$1000.00	\$1000.00
TOTAL EXPENSES TOTAL COSTS (A+B+C):			\$116848.00	\$59500.00	\$57348.00

SUMMARY OF ALL NON CN CONTRIBUTIONS

Non-CN Revenue Sources	Cash	In-Kind	Volunteer	Other	TOTAL
DFO	\$24705.50	\$6500.00			\$31205.50
BCRP	\$14145.00				\$14145.00
MoTH	\$10000.00				\$10000.00
SRWS		\$1997.50			\$1997.50
NON-CN TOTAL:					\$57348.00



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Section H FINAL DISCUSSION & ACKNOWLEDGEMENT

The Squamish River Watershed Society thanks CN and for the opportunity to complete the upgrades to the Squamish River Estuary Training Dyke by installing three new culverts. Without the funding support of the Cheakamus Ecosystem Recovery Fund program this project would likely not have been achieved.

This fall, staff from the Watershed Society and DFO will monitor the effectiveness of the three additional culvert crossings and provide that information in an annual summary report to CN. Please find photos taken during the construction and installation of the culverts in Appendix I. The first culvert was installed in the first week in March, the second culvert installed the second week in April and the final culvert installed the first week in May.

I certify that the information provided in this report, including all attachments, is accurate to the best of my knowledge and that I am authorized to sign on behalf of the stated organization.

Signature: Edith B. Tobe
(Authorized Signatory)

Name: Edith B. Tobe
(Print Name)

Date: May 16, 2008



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Appendix I PHOTOS



Construction begins March 7



Note works being undertaken at low tide and the culvert installed at the lowest tide



View from Squamish River beach at low tide facing east & View facing down dyke at newly installed culvert



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First Culvert in place (tide coming in)



Second Culvert in place (low tide)

