Puntledge River Spawning Habitat Restoration

Bull Island Side-Channel Gravel Placement Project
2002 – 2004
Final Report

02Pu.71

December 2003

Prepared by:

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Executive Summary

Bull Island is located in the falls reach or Reach C of the Puntledge River, approximately 300 m upstream of the Comox logging bridge. This side-channel was known to be used historically by summer-run chinook salmon, but it has suffered from a lack of gravel recruitment due to the construction of the diversion dam.

Bull Island has been the main focus of a two-year habitat restoration project which saw the addition of 2,165 square metres of spawning habitat to this side-channel. The project included the construction of three Newbury-style rock weirs, two downstream of a large log jam and one upstream. Screened spawning gravel (15% ¼" to 1" dia., 50% 1" to 2" dia., and 35% 2" to 3" dia.) was added upstream of each weir. In addition, a large rock deflector or groyne was constructed at the upstream entrance to the Bull Island side-channel to reduce high river flows into the channel during floods. A low elevation rock weir was added upstream of the rock groyne and adjacent the channel entrance to increase the proportion of flow diverted into the channel from the mainstem during low river flows (5.7 m^3/s fisheries maintenance flow). These groynes will improve conditions for spawning, particularly at the lower spawning platform, while maintaining stability of the platforms at high flows. Using a habitat biostandard of 10 m^2 per spawning pair of chinook salmon, it is estimated that the project has provided spawning habitat for at least 216 pairs of salmon - a tenfold increase in the number that could spawn in this channel previously.

Location:	9.5 km from the mouth of the Puntledge River, Bull Island Back Channel is on the Left Bank of the Puntledge River. Access to the Site is off of Duncan Bay Main, near the Comox Logging Bridge crossing the Puntledge River.		
Watershed Code:	92055320094-4200		
Map References:	92 –F-11		
UTM Co-ordinates:	Zone 10.	5505300mN, 351280mE	(NAD27)
Construction Drawings:	31-103-01,31-103-02		
Cost Summary:	Total 2003/04 costs		**$115,104**
	BC Hydro		**$103,598**
	In Kind (DFO, Steelhead Society of BC)		**$ 11,506**
Total Project Costs (2002-2004):			**$ 229,379**

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1 Introduction

1.1 Background

The Puntledge River has historically supported diverse and abundant stocks of salmon and trout, contributing significantly to an economically viable commercial and sport fishery as well as sustaining First Nations in the watershed long before the first non-natives arrived in the area. Since the early 1900s, development in the watershed has compromised natural fish production. These impacts, including 2 dams for hydro electric generation, logging, mining, urban growth, agriculture, industrial uses of the estuary, as well as impacts from over-harvesting and predation from seals are in part responsible for a severe reduction in some stocks, notably chinook salmon and steelhead. Following expansion of the hydro facilities in the 1950s, summer runs of chinook and steelhead salmon declined significantly. Ten-year averages in returns of summer chinook declined from about 3,000 prior to 1955 to 430 during the 1990s, while summer-run steelhead stocks are presently near extinction.

Many initiatives have been implemented over the last 50 years to mitigate these impacts and reverse the declining trends, including an interim flow agreement with B.C. Hydro, a major fish hatchery, fishways, Eicher screens, seal culls, and headwater fish planting to name a few. However, if the re-establishment of a self-sustaining summer chinook stock in the Puntledge River is to be successful, then restoration of the historical spawning habitats is paramount.

1.2 Need Statement

The Bull Island side-channel was known to be used historically by summer-run chinook salmon, but it has suffered from a lack of gravel recruitment due to the construction of the diversion dam. To compensate for this impact, the quantity and quality of spawning gravel in the side-channel was increased several fold. This directly addresses limiting factors described in the Stategic Plan (Chapter 3 – Puntledge River), and conforms to Restoration Objectives stated in section 2.4 of that chapter (B.C. Hydro, December 2000).

1.3 Objectives

The overall goal of the Bull Island restoration project is to increase spawning habitat for summer-run chinook salmon in the falls reach (Reach C) of the Puntledge River in an effort to begin rebuilding the stock to historical escapement levels. After evaluating other impacts and restoration opportunities in the watershed, DFO considers actions to address summer-run chinook spawning habitat the highest priority in restoration planning for the watershed (Guimond, DFO manuscript 2002).

2 Study Area

Bull Island is located in the falls reach or Reach C of the Puntledge River, downstream of Nib falls and about 300 m upstream of the Comox logging bridge (Figure 1). The side-channel is approximately 640 m in length and between 10 and 20 m wide. Flow from the river splits into the side channel at a small upstream islet, then drops over a bedrock incline and down a 140 m long steep boulder-paved section before flattening out in a straight section with a finer gravel and

cobble bed. There is an accumulation of logs and wood debris in a narrow bend in the channel located between 250 and 440 m below the channel entrance. This deeper section provides excellent cover and adult holding habitat. Downstream of the bend is a low gradient section 200 m long, leading back to the mainstem.

3 Methods

3.1 Road Access

Roads on Timber West (TW) and Hancock Forest Management (HFM) properties that were developed during the first phase of the project were reopened for the final construction phase. TW allowed a new gate to be installed on their property to allow daily access to the project site during construction and future monitoring at the channel, after the company removed their gate to another site. Lock blocks were used to restrict access on the road through (HFM) property.

3.2 Site Isolation and Fry Salvage

In June 2003, a stop net was installed at the outlet of Bull Island channel to prevent Chinook adults from entering and holding in the logjam. Bull Island side-channel discharge was reduced from a rate of approximately 3 cms to 200 lpm by building a coffer dam above the entrance to the channel using approximately 75 bulk bags filled with pit run gravel and sealed with heavy gauge clear plastic sheets. The bulk bags were placed with an EX-270 LC excavator on smooth bedrock in Puntledge River. The water discharge into the channel was reduced slowly over 3 days by progressively sealing the bulk bags with clear plastic. At the same time, a fry salvaging crew from the Oyster River Enhancement Society, salvaged fry as the channel dewatered using minnow traps. A minimum flow of 1,500 lpm was maintained in the channel for fry still trapped in the isolated larger pools and logjam which was too difficult to fry salvage. Downstream of the logjam pool, where all of the construction work was carried out, fry were salvaged and released in Puntledge River or the logjam pool. Flow below this point was subsurface and remained isolated from the river throughout construction.

3.3 Gravel Placement

Due to poor truck access in the channel, gravel was placed in the channel using an EX-270 LC and EX-150 excavator. This work took approximately 5.5 days. The gravel was used to make a road down the centre of the channel so that trucks could then be used to deliver shot rock, boulders, oversized rock and LWD to provide bank protection and rearing habitat along both banks of the channel.

3.4 LWD and Boulder Placement

Oversized rocks, boulders and LWD were trucked and dumped along both sides of the temporary road built out of the spawning gravel and placed tightly along both sides of the 13 m wide road in the lower channel. Boulder clusters were also placed in the gravel platform upstream of the logjam. Most of the material was provided at no cost by Timber West Ltd. and from the construction site for the new Home Depot store.

4 Results

A total of 1,938 m^3 of spawning gravel was placed in the lower reach of the channel in 2003 (Figure 2). The gradient of this lower platform is approximately 0.25%. Combined with the volume of spawning gravel added in 2002 (~ 1800 m^3), a total of 2165 m^2 of spawning habitat has been created by the Bull Island Spawning Habitat Restoration Project (810 m^2 upper platform, 300 m^2 middle platform and 1055 m^2 lower platform).

5 Discussion

The total amount of spawning area created by this project (2,165 m^2) is lower than that anticipated (3,000 m^2). After reviewing the results of the incubation survival study in the upper gravel platform (upstream of the logjam) completed in 2002, DFO decided to reduce the width and increase the gradient of the 2003 proposed lower spawning platform to ensure optimum hydraulic conditions for spawning and incubation during low fall/winter flow (i.e. 200 cfs). The existing channel width of the lower reach of Bull Island was over 17 meters. If a gravel platform was constructed to encompass the entire width of the channel at this site, water depths and velocities would be too low to allow spawning and maintenance flows for incubation survival. Therefore, the channel width was reduced using oversized rocks, boulders and LWD. Placing this material tightly along both sides of the temporary road built out of the spawning gravel created 'false' channel banks within the existing channel approximately 13 m wide. The principle of this design was to concentrate the majority of the discharge between the false channel banks and over the spawning gravel platform. This will maintain a water depth suitable for chinook spawning and water velocities optimal for incubation. A small percentage of the flow still passes through the rock/LWD banks to wet the area between the spawning channel and original channel banks creating good access and prime rearing habitat for juveniles.

On October 19, 2003, Reach C flows peaked at 425 cms and Comox Lake inflows (532 cms) were the highest ever recorded since BC Hydro began taking measurements in 1963. This flood event provided a glimpse of how the side-channel components (rock groynes, weirs and spawning platforms) functioned at high flows. The upper deflector groyne prevented high flows from entering the side-channel and although flows in the side-channel were elevated, velocities did not appear to be limiting spawning activity, as observed during an on-site visit 3 days following the event when flows were still high. It is estimated that over 2,000 chinook (summer and fall) spawned in the channel this fall. This is likely a one hundred-fold increase in the number that has spawned in this channel previously.

6 Recommendations

Following the first phase of construction, 3,400 summer chinook eggs were incubated in Jordan-Scotty cassettes at two sites in the newly restored spawning habitat. Survival to the fry stage averaged 98% (Wright and Guimond, 2003). The performance of the completed project will continue to be assessed over the long term and will include some or all of the following monitoring activities:

Physical monitoring – gravel bed surveys and substrate analysis will be conducted to determine the effects, if any, of high river flows on the stability and composition of gravel spawning

platforms and weirs. Discharge measurements will be taken in the side-channel under a range of flows to determine the ratio of flow diverted from the mainstem.

Biological monitoring – using in-situ incubation trials and hydraulic sampling of natural redds, incubation survival will be assessed. Site selection will include habitat covering a range of depth, velocity and substrate characteristics. Not only will incubation survival results provide an estimate of fish production from the side-channel, they will provide a continuing evaluation of gravel quality. Visual observations of spawning activity will also be conducted regularly during the peak spawning season (October – December).

7 Acknowledgements

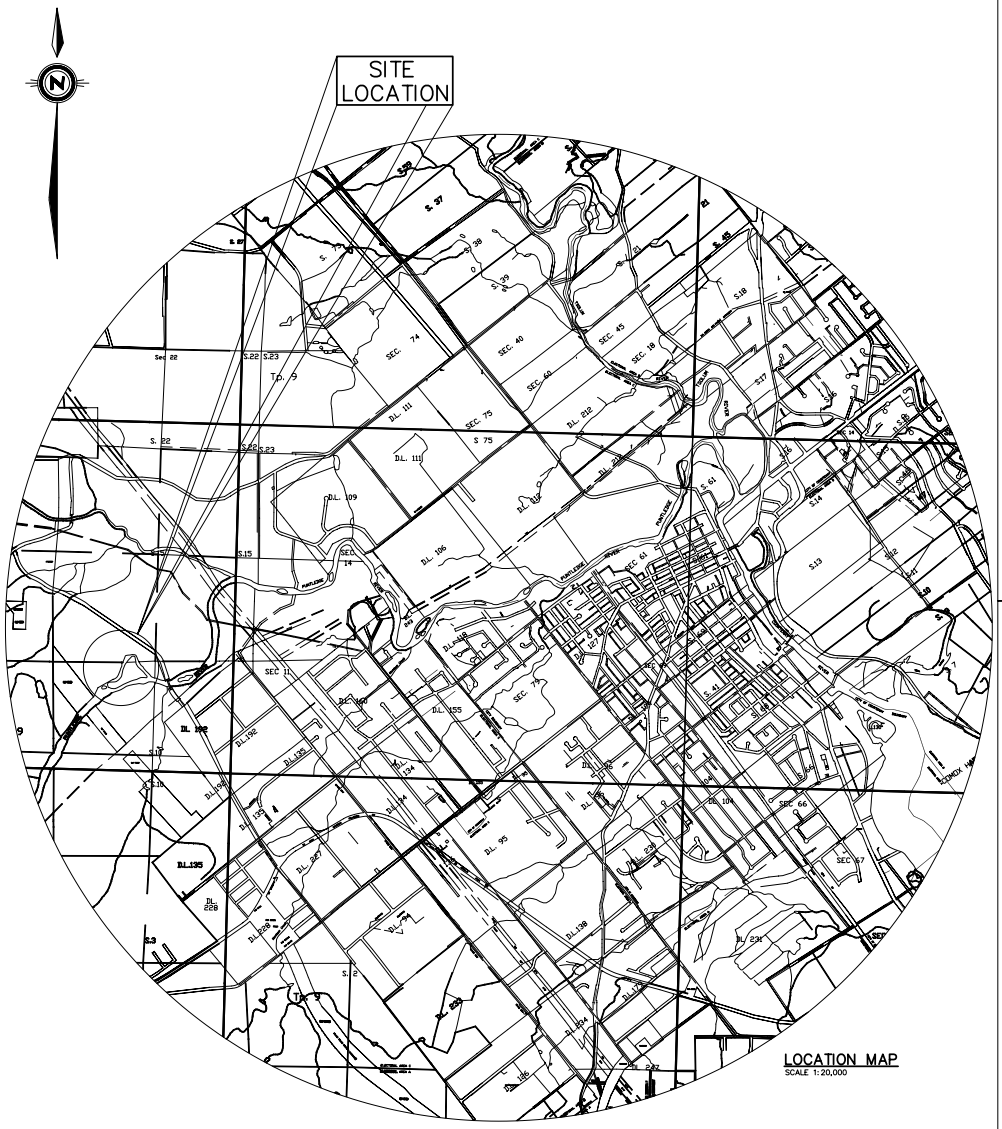
This project was made possible through the financial support of BC Hydro Bridge Coastal Fish and Wildlife Restoration Program and the technical and supervisory support of Fisheries and Oceans Canada Pacific Region Habitat and Enhancement Branch (Nanaimo).

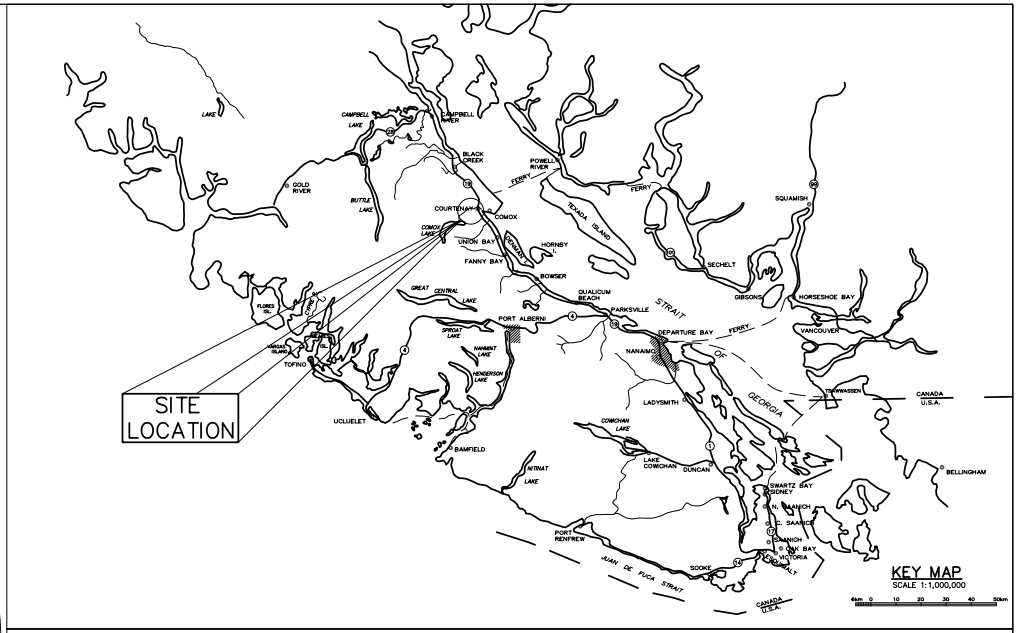
8 References

B.C. Hydro. 2000. Bridge-Coastal Fish and Wildlife Restoration Program Strategic Plan. Prepared by Regional Consulting Ltd., Global Fisheries Consultants Ltd.,.,D.B. Lister & Associates Ltd., and Summers Biological Services with mapping by GIS Innovations.

Guimond, E. 2002. Puntledge Watershed Fisheries Impact Analysis and Restoration Summary. Prepared for the Puntledge Restoration Committee and Fisheries and Oceans Canada. Draft Report.

Wright, M.C. and E. Guimond. 2003. Assessment of incubation survival of summer-run chinook salmon in the Puntledge River headpond and the Bull Island restoration sites. BC Hydro Bridge Coastal Fish and Wildlife Restoration Program,





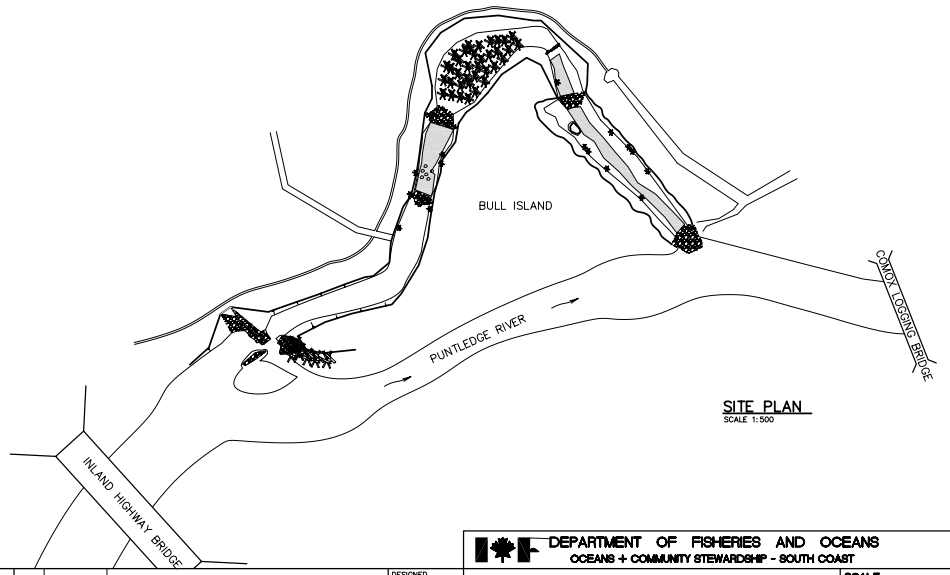


Figure 1. Location map of the Bull Island side-channel.

DWG. NO.	REFERENCE DRAWINGS	NOTES

NO.	DATE	REVISIONS
1	17 OCT 03	PLAN VIEW OF CHANNEL CHANGED TO REFLECT ASBUILT SURVEY 08 OCT 03

DESIGNED
DRAWN RLN
CHECKED
RECOMMENDED
APPROVED
APPROVED

DEPARTMENT OF FISHERIES AND OCEANS
OCEANS + COMMUNITY STEWARDSHIP - SOUTH COAST

PUNTLEDGE RIVER
BULL ISLAND BACK CHANNEL
KEY MAP AND LOCATION MAP

SCALE: AS SHOWN
DATE: 09 JUL 02
DRAWING NUMBER: 31-103-01
REVISION: 1

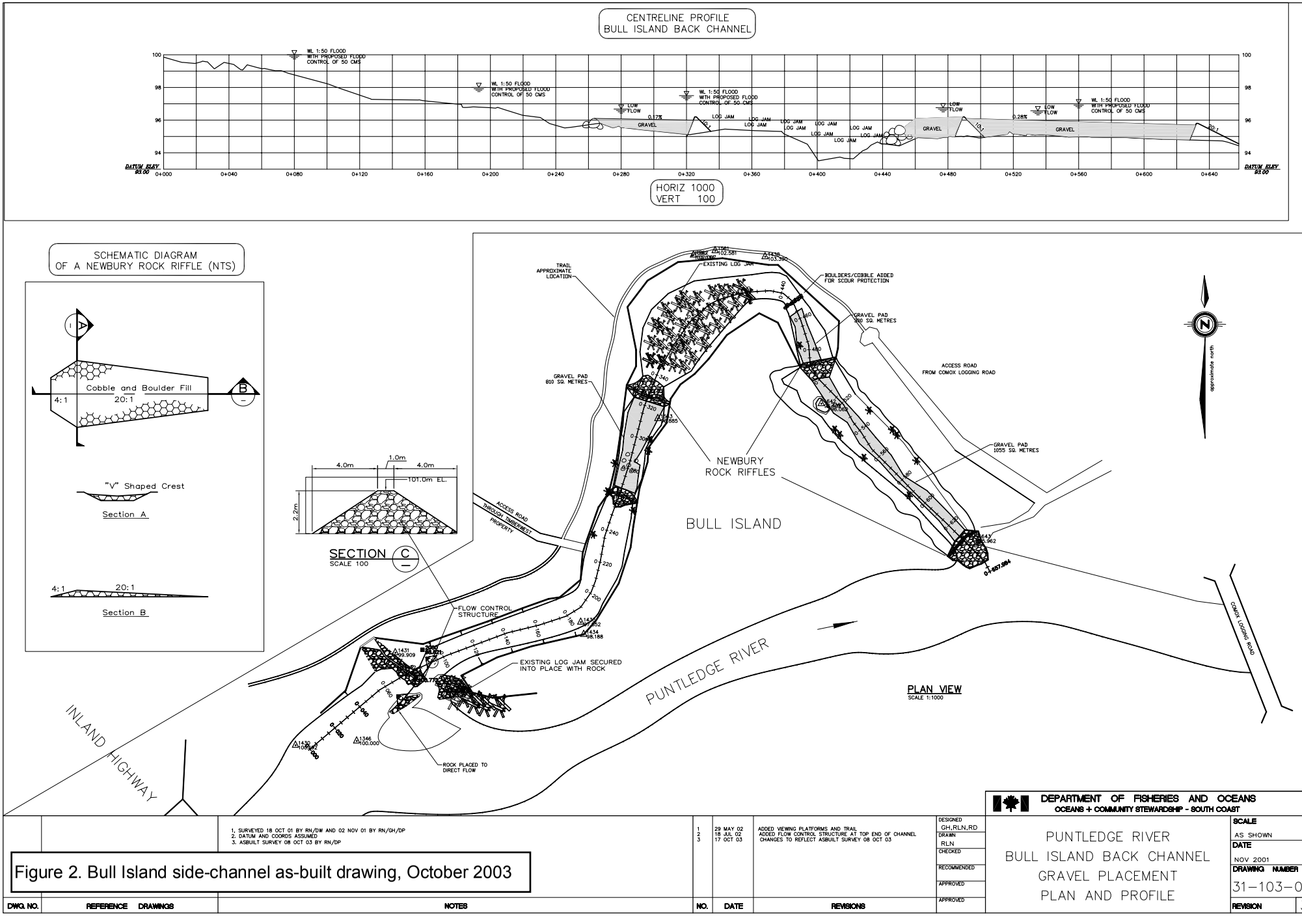


Figure 2. Bull Island side-channel as-built drawing, October 2003

DWG. NO.	REFERENCE DRAWINGS	NOTES	NO.	DATE	REVISIONS
		1. SURVEYED 18 OCT 01 BY RN/DW AND 02 NOV 01 BY RN/GH/DP 2. DATUM AND COORDS ASSUMED 3. ASBUILT SURVEY 08 OCT 03 BY RN/DP	1 2 3	29 MAY 02 18 JUL 02 17 OCT 03	ADDED VIEWING PLATFORMS AND TRAIL ADDED FLOW CONTROL STRUCTURE AT TOP END OF CHANNEL CHANGES TO REFLECT ASBUILT SURVEY 08 OCT 03

DESIGNED GH,RLN,RD
DRAWN RLN
CHECKED
RECOMMENDED
APPROVED
APPROVED

DEPARTMENT OF FISHERIES AND OCEANS
OCEANS + COMMUNITY STEWARDSHIP - SOUTH COAST

PUNTLEDGE RIVER
BULL ISLAND BACK CHANNEL
GRAVEL PLACEMENT
PLAN AND PROFILE

SCALE AS SHOWN
DATE NOV 2001
DRAWING NUMBER 31–103–02
REVISION 3

Photo 1. Looking upstream at the lower spawning platform in the Bull Island side-channel following construction in August 2003.

Photo 2. Looking downstream at the lower spawning platform constructed in August 2003.

Photo 3. Deflector groyne at the entrance to the Bull Island side-channel (from left bank).

Photo 4. Deflector groyne performing at high flows in the Puntledge River, October 2003.

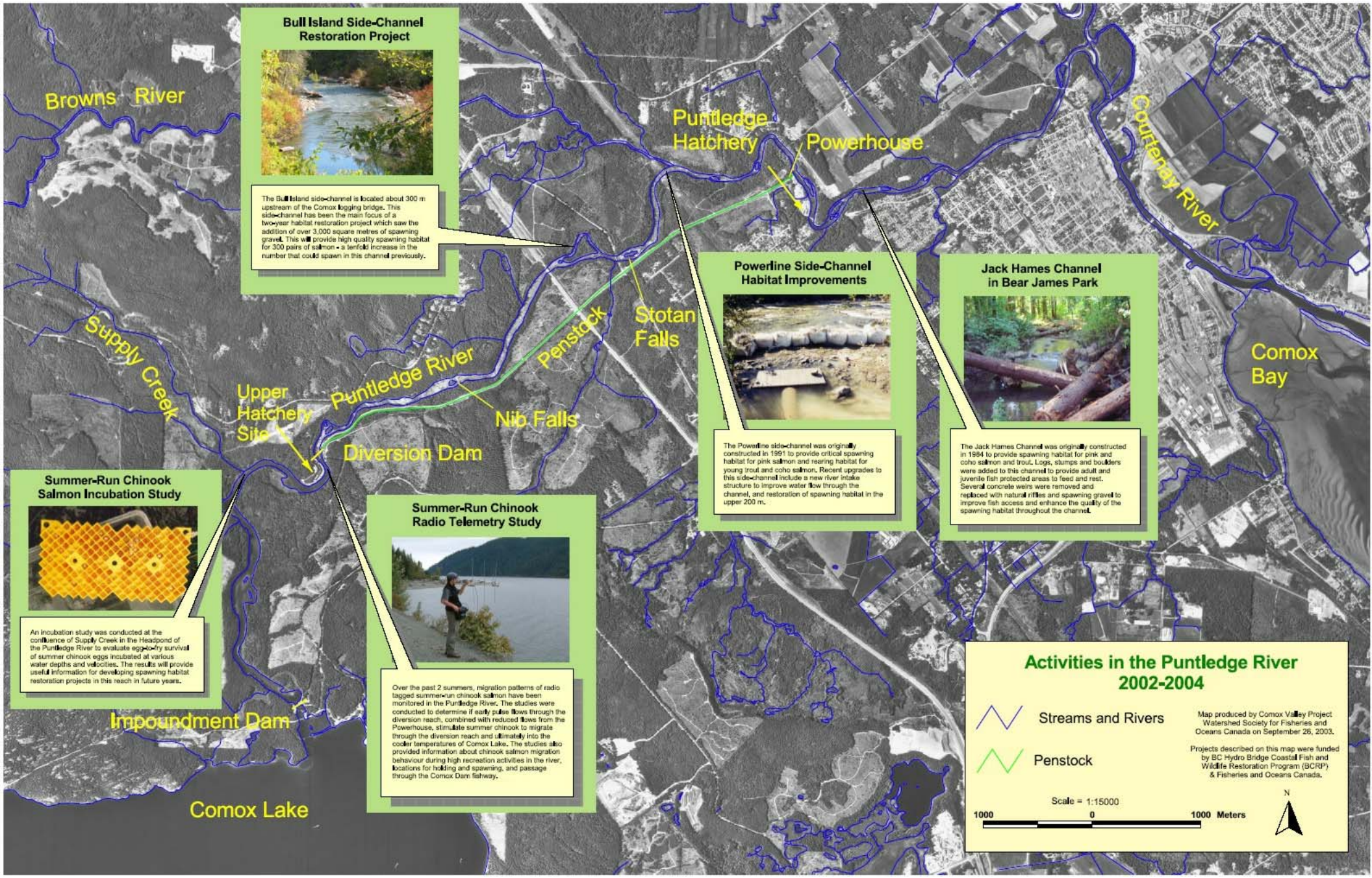
Appendix A

Financial Statement

Income & Expenses

	Income	Expensed	
Income			
BCRP	$ 97,250.00		
In-kind	$ 11,505.55		
Total Income			
Expenses		**BCRP**	**In-kind**
Project Personnel			
Project supervisor	$ 5,075	$ 5,075	
Labour (fry salvage, sign installation)	$ 1,276	$ 1,276	
Professional (engineer, eng-tech, biologist, etc.)	$ 6,300	0	$ 6,300
Equipment & Expenses	0	0	
Heavy Equipment (lowbed, excavator - Ex150, Ex 270, tandem, crane truck)	$ 27,981.5	$ 27,981.5	
Materials (gravel, shot rock, boulders)	$ 53,449.43	$ 53,449.43	
Gate	$ 1,451.25	$ 1,451.25	
Accommodation/meals	$ 1,800	$ 1,800	
Travel expenses	$ 1,857.20	$ 1,857.20	
Signage	$ 3,485	$ 3,485	
Misc. field expenses	$ 120.46	$ 120.46	
Overhead	0	0	
Interest on holdback amounts	$ 1,321.12	$ 1,321.12	
Administration (5% total)	$ 5,205.55	0	$ 5,205.55
GST	$ 5,781.43	$ 5,781.43	
Subtotal	$115,103.94	$103,598.39	$ 11,505.55
Total Expensed		$ 97,250	$ 11,505.55
Balance		$ 6,348.39	0

*Unspent BCRP financial contribution to be returned to: BC Hydro, BCRP
6911 Southpoint Drive (E16)
Burnaby, BC. V3N 4X8
ATTENTION: JANICE DOANE



Appendix B. Confirmation of BCRP Recognition: sample of poster display at Puntledge Hatchery showing summary of activities in the Puntledge River from 2002 - 2004.

One of three signs installed at the Bull Island Side-Channel.