

Coquitlam-Buntzen Water Use Plan

Monitoring Programs and Physical Works Annual Report: 2017

Implementation Period: April 2016 to March 2017

- **COQMON-1 Assessment of Fisheries Access to Streams Tributary to Coquitlam River**
- **COQMON-2 Coquitlam Dam Flow Release Interim Ramping Rate Monitoring**
- **COQMON-3 Lower Coquitlam River Fish Habitat Requirements Study**
- **COQMON-4 Assessment of Pink Salmon Passage in Lower Coquitlam River**
- **COQMON-5 Coquitlam River Periphyton and Benthic Invertebrate Monitoring**
- **COQMON-6 Lower Coquitlam River Temperature Monitoring**
- **COQMON-7 Lower Coquitlam River Fish Productivity Index**
- **COQMON-8 Lower Coquitlam River Substrate Quality Assessment**
- **COQWORKS-1 Modification of Coquitlam Dam Release Facilities (Flow Release Valve)**

For Water Licences 119709, 119710 and 119711

April 26, 2017

BC Hydro Coquitlam-Buntzen Water Use Plan Monitoring Programs and Physical Works Annual Report: 2017

1 Introduction

This document represents a summary of the status and the results of the Coquitlam-Buntzen Water Use Plan (WUP) monitoring programs and physical works to March 31, 2017, as per the Coquitlam-Buntzen Order under the *Water Act*, dated April 21, 2005 and the amendment dated March 8, 2006. There are eight monitoring programs and one physical works.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Coquitlam-Buntzen WUP monitoring programs and physical works were submitted to and approved by the CWR.

Table: 2-1: Dates of Coquitlam-Buntzen WUP TOR Submissions and Approvals by the Comptroller of Water Rights

Monitoring Program & Physical Works TOR	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
COQMON-1 – Assessment of Fisheries Access to Streams Tributary to Coquitlam River	Schedule E.1	Oct 24, 2005	Jan 03, 2006		
COQMON-2 – Coquitlam Dam Flow Release Interim Ramping Rate Monitoring	Schedule E.2	Oct 24, 2005	Jan 03, 2006	Feb 09, 2009	Mar 23, 2009
COQMON-3 – Lower Coquitlam River Fish Habitat Requirements Study	Schedule E.2 portion for COQMON-3 rescinded Mar 13, 2005	Jan 10, 2007	Feb 01, 2007	Feb 09, 2009	Mar 23, 2009
COQMON-4 – Assessment of Pink Salmon Passage in Lower Coquitlam River	Schedule E.2	Oct 24, 2005	Jan 03, 2006	Feb 09, 2009	Mar 23, 2009
COQMON-5 – Coquitlam River Periphyton and Benthic Invertebrate Monitoring	Schedule E.2	Oct 24, 2005	Jan 03, 2006	Feb 09, 2009	Mar 23, 2009
COQMON-6 – Lower Coquitlam River Temperature Monitoring	Schedule E.2	Oct 24, 2005	Jan 03, 2006	Feb 09, 2009	Mar 23, 2009
COQMON-7 – Lower Coquitlam River Fish Productivity Index	Schedule E.2	Feb 08, 2006	Mar 08, 2006	Mar 07, 2016	May 20, 2016
COQMON-8 – Lower Coquitlam River Substrate Quality Assessment	Schedule E.2	Oct 24, 2005	Jan 03, 2006	Jun 16, 2016	Jul 26, 2016
COQWORKS-1 – Modification of Coquitlam Dam Release Facilities (Flow Release Valve)	Schedule B	Oct 24, 2005	Dec 02, 2005	Apr 29, 2009	App not required

3 Schedule

The following table outlines the current schedule for the monitoring programs and physical works being delivered for the Coquitlam-Buntzen WUP.

Table 3-1: Monitoring Programs and Physical Works Schedule as of March 31, 2017

Monitoring Programs	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	WLR Yr1	WLR Yr2	WLR Yr3	WLR Yr4	WLR Yr5	WLR Yr6	WLR Yr7	WLR Yr8	WLR Yr9	WLR Yr10	WLR Yr11	WLR Yr12 ³
COQMON-1 – Assessment of Fisheries Access to Streams Tributary to Coquitlam River	✓	✓	✓F									
COQMON-2 – Coquitlam Dam Flow Release Interim Ramping Rate Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
COQMON-3 – Lower Coquitlam River Fish Habitat Requirements Study	DEL ¹	DEL ¹	DEL ¹	✓	✓	✓	✓				✓F	
COQMON-4 – Assessment of Pink Salmon Passage in Lower Coquitlam River		✓		✓		✓		✓		✓F		
COQMON-5 – Coquitlam River Periphyton and Benthic Invertebrate Monitoring	✓	DEL ¹	DEL ¹	✓	✓	✓	✓F					
COQMON-6 – Lower Coquitlam River Temperature Monitoring	✓	✓	✓	✓	✓	✓	✓F					
COQMON-7 – Lower Coquitlam River Fish Productivity Index	Smolt and Fry Outmigration Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
	Fry and Juvenile Standing Stock Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
	Fall Adult Salmon Escapement Surveys	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
	Steelhead Redd Surveys	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
	Recruitment Analysis	✓	✓	✓								■ ³
COQMON-8 – Lower Coquitlam River Substrate Quality Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
Physical Works												
COQWORKS-1 – Modification of Coquitlam Dam Release Facilities (Flow Release Valve)	DEL ²	DEL ²	✓	✓F								

- Legend:
- = Program to be undertaken/initiated in identified year
 - ✓ = Program completed for the year
 - DEL = Program is delayed for the year
 - ✓F = All field work for this project is complete. No further field work is planned.

Footnotes:

1. Program delayed due to postponement of required flow release structure modification and associated modified flow regime to October 23, 2008.
2. The installation of the release valve was delayed due to existing dam seismic upgrade repairs.
3. No field work, data results analysis only.

4 Monitoring Programs and Physical Works Terms of Reference

The monitoring programs and physical works being implemented under the Coquitlam-Buntzen WUP are described in Terms of Reference. These Terms of Reference and the reports for work completed to date can be found here:

http://www.bchydro.com/about/sustainability/conservation/water_use_planning/low_er_mainland/coquitlam_buntzen.html

5 Status of Monitoring Programs

5.1 COQMON-1 Assessment of Fisheries Access to Streams Tributary to Coquitlam Reservoir

This program was initiated in 2006 and completed in 2008. The objective of the study was to assess three Coquitlam Reservoir tributaries for fish use, access, and habitat potential. A migration barrier was discovered in one of the tributaries (Meech Creek), which was subsequently removed in August 2009.

5.2 COQMON-2 Coquitlam Dam Flow Release Interim Ramping Rate Monitoring

The objective of this monitoring program is to report on the fish stranding impacts in the lower Coquitlam River associated with the implementation of the interim ramping rate protocol for the Coquitlam Dam. This monitoring program was initiated in 2006 and will be carried out over 11 years. The Year 11 report is in draft and under review, and will be included in next year's annual report.

Results from COQMON-2 have shown high numbers of stranded Coho fry during the May to June flow change. A variance request to the Ordered Instream Flow Release Target was approved by the CWR on April 27, 2016, for a delay of the June 1st instream flow release target to June 15th, which was recommended to provide additional development time for Coho fry. The flow variance is monitored under the COQMON-2 to determine the effects of the altered regime on Coho fry stranding. Preliminary results indicate that the number of fry mortalities decreased in 2016 but the stranding remained high under the modified flow regime.

5.3 COQMON-3 Lower Coquitlam River Fish Habitat Requirements Study

This program was initiated in 2008. During the development of the Coquitlam WUP, generic provincial criteria was used to model habitat requirements for fish species of interest, which contributed to the flow targets developed for the river. The objective of the study is to identify any changes to the habitat suitability criteria used in the Coquitlam-Buntzen WUP calculations of weighted useable area of habitat, and refine the habitat-flow relationships and flow release targets developed in the WUP.

Fieldwork and data analysis is complete. The objective of the analysis is to update the habitat-flow model developed during the WUP process that predicts the effects of flow on fisheries habitats specific to the Lower Coquitlam River. The draft report is under review and will be submitted with the next year's annual report.

5.4 COQMON-4 Assessment of Pink Salmon Passage in Lower Coquitlam River

This monitoring program was initiated in August 2007 with the onset of pink salmon migration in the Coquitlam River, which continued through the low flow September period. The objective of this monitoring program is to monitor the migration of returning pink salmon in odd years to determine if there are any flow-related partial or complete migration barriers in the Lower Coquitlam River corridor.

This program is complete.

5.5 COQMON-5 Coquitlam River Periphyton and Benthic Invertebrate Monitoring

This program was initiated in 2006 and completed in 2012.

The objective of this monitoring program was to develop a predictive model for evaluating periphyton and invertebrate benefits associated with Lower Coquitlam River flow alternatives.

5.6 COQMON-6 Lower Coquitlam River Temperature Monitoring

This program was initiated in 2006 and completed in 2012.

The objective of this monitoring program was to identify if and how temperature in the lower Coquitlam River is influenced by reservoir operations.

5.7 COQMON-7 Lower Coquitlam River Fish Productivity Index

This monitoring program under the WUP was initiated in 2006, although data collection commenced pre-WUP in 2000. The Year 10 report is in draft and under review, and will be included in next year's annual report.

The intent of the monitoring program is to develop a fish productivity index for target species, which compares the number of out-migrating smolts to the number of spawners. This will allow assessment of the fish productivity response of the flow trials underway in the Lower Coquitlam River.

5.8 COQMON-8 Lower Coquitlam River Substrate Quality Assessment

This monitoring program was initiated in 2006 and will be carried out over 11 years. The Year 8 report (2014-2015) is in draft and under review, and will be included in next year's annual report.

In 2015 and 2016, discussions with First Nations, stakeholders and agencies were held regarding clarifications of the definition of flushing flows outlined in the TOR. The definition was revised in an approved TOR addendum on July 26, 2016, to be any natural high flow event greater than 70 cms. In 2016, after high flow events on the Coquitlam River, measurements were taken to assess substrate quality (e.g. particle size, embeddedness, pebble counts, turbidity and water velocity) to determine the effect on substrate. As well, in 2016, the use of a freeze-core sampling method was trialed in a one-year pilot to gather data at spawning depths. The freeze-core sampling was determined to be an ineffective method due to logistical and safety concerns, and will be discontinued.

6 Summary of Physical Works

6.1 COQWORKS-1 Modification of Coquitlam Dam Release Facilities (Flow Release Valve)

The replacement of the existing low level outlet gate was required to facilitate the releases to the Coquitlam River ordered by the CWR and recommended in the

Coquitlam-Buntzen WUP. The new gate assembly was installed in October 2008. This physical works project was completed in 2009.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Coquitlam-Buntzen WUP monitoring programs and physical works costs approved by the CWR and the Actual Costs to March 31, 2017.

Table 7-1: Coquitlam - Buntzen WUP Monitoring Programs and Physical Works Costs

Monitoring Programs	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
COQ Prepare Annual Report	\$32,353	\$17,876	\$5,236	\$23,112	\$9,241		
COQM01A Access to Streams	\$26,582	\$20,615	\$3,200	\$23,815	\$2,767	Project complete - Completion report outstanding	
COQM01A Access to Streams - OR DM	\$16,322	\$8,434	\$3,200	\$11,634	\$4,688		
COQM01A Access to Streams - OR Imp	\$10,260	\$12,181	\$0	\$12,181	(\$1,921)		
COQM02A Dam Flow Release R	\$160,791	\$116,984	\$19,409	\$136,393	\$24,398	Efficiencies found during project implementation	
COQM02A Dam Flow Release R - OR DM	\$55,353	\$28,813	\$8,439	\$37,252	\$18,101		
COQM02A Dam Flow Release R - OR Imp	\$105,438	\$88,171	\$10,970	\$99,141	\$6,297		
COQM03A Fish Habitat Suitabil	\$115,374	\$94,044	\$6,271	\$100,315	\$15,059	Efficiencies found during project implementation	
COQM03A Fish Habitat Suitabil - OR DM	\$31,018	\$17,925	\$6,270	\$24,195	\$6,823		
COQM03A Fish Habitat Suitabil - OR Imp	\$84,356	\$76,119	\$1	\$76,120	\$8,236		
COQM04A Pink Salmon Passage	\$70,698	\$53,106	\$4,367	\$57,473	\$13,225	Project complete - Completion report outstanding	
COQM04A Pink Salmon Passage - OR DM	\$32,947	\$15,355	\$4,367	\$19,722	\$13,225		
COQM04A Pink Salmon Passage - OR Imp	\$37,751	\$37,751	\$0	\$37,751	(\$0)		
COQM05A Periphyton & Benthic	\$268,770	\$238,560	\$3,200	\$241,760	\$27,010	Project complete - Completion report outstanding	
COQM05A Periphyton & Benthic - OR DM	\$29,883	\$14,087	\$3,200	\$17,287	\$12,596		
COQM05A Periphyton & Benthic - OR Imp	\$238,887	\$224,473	\$0	\$224,473	\$14,414		
COQM06A Lower COQ River Temp	\$62,539	\$62,128	\$3,200	\$65,328	(\$2,789)	Project complete - Completion report outstanding	resubmit TOR to allow for completion reporting
COQM06A Lower COQ River Temp - OR DM	\$12,969	\$12,547	\$3,200	\$15,747	(\$2,778)		
COQM06A Lower COQ River Temp - OR Imp	\$49,570	\$49,580	\$0	\$49,580	(\$10)		
COQM07A Fish Productivity Ind	\$2,971,076	\$2,631,534	\$232,965	\$2,864,499	\$106,577	Efficiencies found during project implementation	
COQM07A Fish Productivity Ind - OR DM	\$120,480	\$112,092	\$8,093	\$120,185	\$295		
COQM07A Fish Productivity Ind - OR Imp	\$2,850,596	\$2,519,442	\$224,872	\$2,744,314	\$106,282		
COQM08A Substrate Quality Ass	\$416,664	\$361,842	\$22,587	\$384,429	\$32,235	Efficiencies found during project implementation	
COQM08A Substrate Quality Ass - OR DM	\$80,392	\$46,555	\$7,241	\$53,796	\$26,596		
COQM08A Substrate Quality Ass - OR Imp	\$336,272	\$315,287	\$15,346	\$330,633	\$5,639		
COQW01A Mod COQ Dam Release - OR L4	\$867,977	\$867,979	\$635	\$868,614	(\$637)	Project complete - Completion report outstanding	resubmit TOR to allow for completion reporting
COQW01A Mod COQ Dam Release - OR DM	\$9,279	\$57,185	\$635	\$57,820	(\$48,541)		
COQW01A Mod COQ Dam Release - OR Imp	\$858,698	\$810,794	\$0	\$810,794	\$47,904		
COQW01A Mod COQ Dam Release - ONR L4		\$212		\$212	(\$212)	COQW01 was overspent without approval from CWR, overage was absorbed through ONR funds.	
COQW01A Mod COQ Dam Release - ONR DM OS		\$212		\$212	(\$212)		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.