

Clowhom Project Water Use Plan

Monitoring Programs

Annual Report: 2017

Implementation Period: May 2016 to April 2017

- **COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations**
- **COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity**
- **COMMON-3 Validation of the Effective Littoral Zone Performance Measure**
- **COMMON-4 Archaeological Sites Monitoring**

For Water Licences 120562, 120565, and Conditional Water Licence 119822

May 31, 2017

BC Hydro Clowhom Project Water Use Plan Monitoring Programs Annual Report: 2017

1 Introduction

This document represents a summary of the status and the results of the Clowhom Project Water Use Plan (WUP) monitoring programs to April 30, 2017, as per the Clowhom Order under the *Water Act*, dated April 20, 2005. There are four monitoring programs.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Clowhom Project WUP monitoring programs were submitted to and approved by the Comptroller of Water Rights (CWR).

Leave to commence was not received for the COMMON-4 Archaeological Sites Monitoring TOR. As per the October 28, 2005 letter, this work will proceed under the *Heritage Conservation Act*.

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

Monitoring Program TORs	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Schedule A.1.a	Sep 23, 2005	Oct 28, 2005		
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity	Schedule A.1.b	Sep 23, 2005	Oct 28, 2005	Apr 02, 2015	Apr 23, 2015
COMMON-3 Validation of the Effective Littoral Zone Performance Measure	Schedule A.1.c	Sep 23, 2005	Oct 28, 2005		
COMMON-4 Archaeological Sites Monitoring	Schedule A.2	Sep 23, 2005	Oct 28, 2005		

3 Schedule

The following table outlines the current schedule for the monitoring programs being delivered for the Clowhom Project WUP.

Table 3-1: Monitoring Programs Schedule as of April 30, 2017

Monitoring Program	Study	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11	WLR YR12	WLR YR13	WLR YR14	WLR YR15	WLR YR16	WLR YR17	WLR YR18	WLR YR19	WLR YR20
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Wildlife Census	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■	■	■	■	■	■	■	■	■
	Air Photography	✓				✓	✓				X'	✓				■					■
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity	Fish Survey	✓		✓	✓	✓	✓				X'	✓				■					■
	Juvenile Habitat Use Survey		X	✓	X	✓	✓					✓									
COMMON-3 Validation of the Effective Littoral Zone Performance Measure		✓	✓	✓	✓	✓	✓				X'	✓	■			■					■
COMMON-4 Archaeological Sites Monitoring			X	✓	✓F																

Legend: ■ = Project to be undertaken in identified year
 ✓ = Project is completed for the year
 X = Encountered operational or hydrological delays
 X' = Work delayed due to program review
 ✓F = All field work for this project is complete. No further field work is planned.
 PCR = Project Completion Report submitted

4 Monitoring Programs Terms of Reference

The monitoring programs being implemented under the Clowhom Project WUP are described in Terms of Reference (TOR). These Terms of Reference and the reports for work completed to date can be found here:

http://www.bchydro.com/toolbar/about/sustainability/conservation/water_use_planning/lower_mainland/clowhom.html

5 Status of Monitoring Programs

5.1 COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations

The objective of this work is to determine to what extent the ecology (e.g., species diversity) in the wetland at upper end of Clowhom Falls Reservoir is linked to the operation of the reservoir. The wildlife census component of this monitoring program was initiated in 2006 and will be carried out annually over 20 years. The wildlife census field work has been completed for 2016.

Review of the monitoring program result against the respective TOR management questions is underway to ensure the monitoring programs are continuing to add value and meet the intent of the Order. In 2016, in addition to the wildlife census, a literature review to evaluate which species are likely to be affected most by changes in reservoir water levels has been completed.

Aerial photography for the third census rotation (i.e., third period of each of the four year periods in the monitoring program) was flown in fall 2016. Vegetation classification and mapping will be completed in 2017 using the aerial photography acquired in 2016.

Attached is the report, with field sampling results for Year 11 (2016) dated May 12, 2017.

5.2 COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity

The objective of this 20 year monitoring program is to track changes in fish productivity through sampling of rearing populations. This program was developed and implemented in 2006 to measure if fish productivity decreased due to a reduction

in productive littoral habitat following the impoundment of Clowhom Lake in 1956. Fish surveys occurred in alternate years from 2006 to 2010 and are scheduled to occur at five year intervals thereafter. The latest survey was completed in September 2016; the previous survey was completed in 2011.

Analysis of fish productivity and fish habitat use data collected in 2016 is currently underway. This report was to be submitted by May 31, 2017, however due to delays in data analysis and reporting we anticipate it will be attached to the 2018 Annual Report.

5.3 COMMON-3 Validation of the Effective Littoral Zone Performance Measure

The objective of this program is to detect changes in the reservoir littoral zone (e.g. the part of the reservoir close to shore) and compare them to model predictions validating performance measures for the different reservoir operational alternatives.

This monitoring program was initiated in 2006, implemented in consecutive years until 2010 and then at five year intervals. Data analysis and reporting starting from 2006 and including the 2016 data collection is currently underway and will be compiled in a 10 year summary report. The Effective Littoral Zone (ELZ) modelling validation (COMMON-3) describing the relationship between periphyton production, which is an important measure of productivity, and light availability is expected to be complete in 2017. The model validation results will be a key step in answering the management question and meeting the objective for COMMON-3.

This report will be submitted in the 2018 Annual Report.

5.4 COMMON-4 Archaeological Sites Monitoring

This monitoring program was initiated in 2008, was carried out over two years, and is complete.

6 Monitoring Programs Costs

The following table summarizes the Clowhom Project WUP monitoring programs costs approved by the CWR and the Actual Costs to April 30, 2017.

Table 6-1: Clowhom Project WUP Monitoring Program 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
COM Prepare Annual Report	\$43,186	\$13,241	\$14,920	\$28,161	\$15,025		
COMM01A Mon Aquatic Wildlife	\$364,673	\$152,013	\$222,129	\$374,142	(\$9,469)	Forecasted overspend	TOR resubmission in spring 2018
COMM01A Mon Aquatic Wildlife - ONR DM	\$174,773	\$42,103	\$79,679	\$121,782	\$52,991		
COMM01A Mon Aquatic Wildlife - ONR Imp	\$189,900	\$109,910	\$142,450	\$252,360	(\$62,460)		
COMM02A Role Littoral Zone	\$188,424	\$80,167	\$79,768	\$159,935	\$28,489	Effeciencies found during project implementation	
COMM02A Role Littoral Zone - ONR DM	\$85,324	\$25,537	\$29,933	\$55,470	\$29,854		
COMM02A Role Littoral Zone - ONR Imp	\$103,100	\$54,630	\$49,835	\$104,465	(\$1,365)		
COMM03A Valid Littoral Zone	\$155,909	\$112,652	\$4,175	\$116,827	\$39,082	Effeciencies found during project implementation	
COMM03A Valid Littoral Zone - ONR DM	\$57,909	\$18,868	\$4,175	\$23,043	\$34,866		
COMM03A Valid Littoral Zone - ONR Imp	\$98,000	\$93,784	\$0	\$93,784	\$4,216		
COMM04A Archaeological Sites	\$0	\$7,350	\$0	\$7,350	(\$7,350)	Project Complete	
COMM04A Archaeological Sites - ONR DM	\$0	\$6,681	\$0	\$6,681	(\$6,681)		
COMM04A Archaeological Sites - ONR Imp	\$0	\$669	\$0	\$669	(\$669)		

ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.