

Columbia River Project Water Use Plan Revelstoke Flow Management Plan

Monitoring Program

Annual Report: 2015

Implementation Period: February 2014 to January 2015

- **CLBMON-15a Middle Columbia River Physical Habitat Monitoring**
- **CLBMON-15b Middle Columbia River Ecological Productivity Monitoring**
- **CLBMON-16 Middle Columbia River Fish Population Indexing Surveys**
- **CLBMON-17 Middle Columbia River Juvenile Fish Habitat Use**
- **CLBMON-18 Middle Columbia River Adult Fish Habitat Use**
- **CLBMON-53 Middle Columbia Juvenile Fish Stranding**

Conditional Water Licences for Kinbasket storage (27068 and 39432), Mica diversion (39431), Revelstoke diversion and storage (47215), and Arrow storage (27066)

February 28, 2015

BC Hydro Columbia River Project Water Use Plan Revelstoke Flow Management Plan Monitoring Programs Annual Report: 2015

1 Introduction

This document represents a summary of the status and the results of the Columbia River Revelstoke Flow Management Plan Water Use Plan (WUP) monitoring programs and physical works to January 31, 2015, as per the Columbia River Order under the *Water Act*, dated January 26, 2007. There are six monitoring programs.

2 Status

The following table outlines the dates that TOR for the Revelstoke Flow Management Plan WUP monitoring programs were submitted to and approved by the CWR.

Table: 2-1: Dates of Revelstoke Flow Management Plan 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
CLBMON-15a Middle Columbia River Physical Habitat Monitoring	Schedule C, Clause 4 (a);	Mar 05, 2007	Mar 22, 2007	Jan 29, 2015	Pending
CLBMON-15b Middle Columbia River Ecological Productivity Monitoring	Schedule C, Clause 4 (a)	Mar 05, 2007	Mar 22, 2007	May 21, 2010	Jul 19, 2010
CLBMON-16 Middle Columbia River Fish Population Indexing Surveys	Schedule C, Clause 4 (b)	Mar 05, 2007	Mar 22, 2007	Jul 12, 2013	Jul 22, 2013
CLBMON-17 Middle Columbia River Juvenile Fish Habitat Use	Schedule C, Clause 4 (c)	Mar 05, 2007	Mar 22, 2007	May 21, 2010	Jul 19, 2010
CLBMON-18 Middle Columbia River Adult Fish Habitat Use	Schedule C, Clause 4 (d)	Mar 05, 2007	Mar 22, 2007	May 21, 2010	Jul 19, 2010
CLBMON-53 Middle Columbia River Juvenile Fish Stranding	Amended Order, Clause 2 (c)	Jul 31, 2008	Sep 11, 2008	Feb 02, 2009	Mar 26, 2009

3 Schedule

The following table (Table 3-1) outlines the current schedule for the monitoring programs and physical works being delivered for the Revelstoke Flow Management Plan WUP.

Table 3-1: Table of WUP Schedule

Monitoring Programs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	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
CLBMON-15a Middle Columbia River Physical Habitat Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	■	■	■	■	■
CLBMON-15b Middle Columbia River Ecological Productivity Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	■	■	■	■	■
CLBMON-16 Middle Columbia River Fish Population Indexing Surveys	✓	✓	✓	✓	✓	✓	✓	✓	■	■	■	■	■
CLBMON-17 Middle Columbia River Juvenile Fish Habitat Use		✓	✓	✓	✓	✓	✓			◆			
CLBMON-18 Middle Columbia River Adult Fish Habitat Use		✓	✓	✓	x	x	x	x	◆	■	■	■	
CLBMON-53 Middle Columbia River Juvenile Fish Stranding			✓	✓	✓	x	✓						
Legend: <ul style="list-style-type: none"> ■ = Program to be undertaken/initiated in identified year ◆ = Program proposed to be undertaken in identified year (pending approval) ✓ = Program completed for the year x = Program started, but encountered operational or hydrological delays 													

4 Monitoring Programs and Physical Works Terms of Reference

The monitoring programs and physical works being implemented under the Revelstoke Flow Management Plan 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/southern_interior/columbia_river/revelstoke-flow.html

5 Summary of Monitoring Programs

5.1 CLBMON-15a Middle Columbia River Physical Habitat Monitoring

5.1.1 Status

This monitoring program was initiated in 2007 and will be carried out over 13 years. Attached is the report for Year 7 (2013). The Year 8 (2014) draft report is in preparation. As an outcome of the Revelstoke Flow Management Plan (RFMP) technical review in February 2014, BC Hydro resubmitted a TOR on January 29, 2015, and is pending CWR approval.

5.2 CLBMON-15b Middle Columbia River Ecological Productivity Monitoring

5.2.1 Status

This monitoring program was initiated in July 2007 and will be carried out over 13 years. Attached is the report for Year 7 (2013) dated September 2014. The Year 8 (2014) draft report is in preparation and will be included in next year's annual report.

5.3 CLBMON-16 Middle Columbia River Fish Population Indexing Surveys

5.3.1 Status

This monitoring program was initiated in October 2007 and will be carried out over 13 years. Attached is the report for Year 7 dated February 2015. The Year 8 (2014) draft report is in preparation and will be included in next year's annual report.

5.4 CLBMON-17 Middle Columbia River Juvenile Fish Habitat Use

5.4.1 Status

This monitoring program was initiated in 2008 and will be carried out over six years. Attached is the report for Year 6 dated June 2014. While the study has been completed according to the approved TOR, the resolution of some of the management questions would benefit from further analysis taking into account habitat suitability indices derived from modelling in CLBMON-15a.

A TOR resubmission outlining the recommended additional analysis will be submitted to your office by November 30, 2015.

5.5 CLBMON-18 Middle Columbia River Adult Fish Habitat Use

5.5.1 Status

This monitoring program was initiated in 2008 and will be carried out over six years. The first three years were completed in 2008-2010. As an outcome of the RFMP technical review, for 2015, BC Hydro is developing a proposal to model the energetic expenditure of fish based on flow, and postpone the final three years of the monitoring project until 2016, 2017, and 2018.

A TOR resubmission outlining the proposal will be submitted to your office by March 31, 2015.

5.6 CLBMON-53 Middle Columbia River Juvenile Fish Stranding

5.6.1 Status

This monitoring program was initiated in 2009 and has been carried out over four years. The first three years have been completed for 2009-2011. There was no work implemented in 2012. The fourth and final year was implemented in 2013. Attached is the final report for Year 4 dated March 2014. The project is now complete.

6 Monitoring Programs Costs

The following table summarizes the Revelstoke Flow Management Plan WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to January 31, 2015.

Table 6-1: Revelstoke Flow Management Plan WUP Monitoring Programs 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
C04 Prepare Annual Report	\$5,463	\$2,844	\$2,619	\$5,463	\$0		
C04M15 MID COL Phys Hab & Ecol Prod	\$4,052,513	\$2,234,939	\$1,762,483	\$3,997,423	\$55,090	Efficiencies found during project implementation	
C04M15A MID COL Phys Hab & Ecol Prod - OR DM	\$264,235	\$110,049	\$99,097	\$209,145	\$55,090		
C04M15A MID COL Phys Hab & Ecol Prod - OR Imp	\$3,788,278	\$2,124,891	\$1,663,387	\$3,788,278	\$0		
C04M16A MID COL Fish Index	\$2,880,201	\$1,392,248	\$1,275,043	\$2,667,291	\$212,910	Efficiencies found during project implementation	
C04M16A MID COL Fish Index - OR DM	\$105,704	\$77,844	\$41,686	\$119,531	(\$13,827)		
C04M16A MID COL Fish Index - OR Imp	\$2,774,497	\$1,314,403	\$1,233,357	\$2,547,760	\$226,737		
C04M17A MID COL Juvenile Hat - OR	\$495,994	\$472,184	\$0	\$472,184	\$23,810	Project complete. Efficiencies found during project implementation.	
C04M17A MID COL Juvenile Hat - OR DM	\$39,494	\$38,180	\$0	\$38,180	\$1,314		
C04M17A MID COL Juvenile Hat - OR Imp	\$456,500	\$434,005	\$0	\$434,005	\$22,495		
C04M17A MID COL Juvenile Hat - ONR	\$103,056	\$103,074	\$0	\$103,075	(\$19)	Project complete.	
C04M17A MID COL Juvenile Hat - ONR Imp	\$103,056	\$103,074	\$0	\$103,075	(\$19)		
C04M18A MID COL Adult Fish - OR	\$862,641	\$545,048	\$337,852	\$882,900	(\$20,259)	Direct management is forecast to be higher than originally budgeted. Forecast does not reflect changes in the upcoming TOR resubmission.	TOR resubmission by Mar 31, 2015
C04M18A MID COL Adult Fish - OR DM	\$42,322	\$32,499	\$30,082	\$62,581	(\$20,259)		
C04M18A MID COL Adult Fish - OR Imp	\$820,319	\$512,549	\$307,770	\$820,319	\$0		
C04M18A MID COL Adult Fish - ONR	\$178,104		\$178,104	\$178,104	\$0	Project has not yet commenced.	
C04M18A MID COL Adult Fish - ONR Imp	\$178,104		\$178,104	\$178,104			
C04M53A MID COL Fish Strand	\$179,222	\$155,451	\$0	\$155,451	\$23,771	Project complete. Efficiencies found during project implementation.	
C04M53A MID COL Fish Strand - ONR DM	\$58,310	\$40,181	\$0	\$40,181	\$18,129		
C04M53A MID COL Fish Strand - ONR Imp	\$120,912	\$115,270	\$0	\$115,270	\$5,642		

OR - Ordered Remissible
 ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.