

Bridge River Water Use Plan Monitoring Program and Physical Works

Annual Report: 2017

Implementation Period: February 2016 to January 2017

- **BRGMON-1 Lower Bridge River Aquatic Monitoring**
- **BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring**
- **BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration**
- **BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring**
- **BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring**
- **BRGMON-6 Seton Lake Aquatic Productivity Monitoring**
- **BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring**
- **BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring**
- **BRGMON-9 Seton River Habitat and Fish Monitoring**
- **BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement**
- **BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring**
- **BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program**
- **BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program**
- **BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed**
- **BRGMON-15 Seton Lake Erosion Mitigation Program**
- **BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring**
- **BRGWORKS-1 Carpenter Revegetation**
- **BRGWORKS-2 Seton Lake Erosion**

For Water Licences FWL 126279, 126278, 126280, 126281, 126286, 126287, 126288, 126282, 126283, 12680, 126250 and 126259.

February 28, 2017

BC Hydro Bridge River Project 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 Bridge River Water Use Plan (WUP) monitoring programs and physical works to January 31, 2017, as per the Bridge River Order under the *Water Act*, dated March 30, 2011. There are 16 monitoring programs and two physical works.

2 Status

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

Table: 2-1: Dates of Bridge River 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
BRGMON-1 Lower Bridge River Aquatic Monitoring	Schedule A.1	Jan 30, 2012	Apr 12, 2012		
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring	Schedule A.6	Jan 30, 2012	Jun 26, 2012		
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	Schedule A.10	Jan 30, 2012	Feb 07, 2012		
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring	Schedule A.7	Jan 30, 2012	Jun 06, 2012	Mar 23, 2015	May 01, 2015
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring	Schedule A.2	Mar 30, 2012	Jul 11, 2012		
BRGMON-6 Seton Lake Aquatic Productivity Monitoring	Schedule A.14	Mar 14, 2014	Apr 23, 2014		
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring	Schedule A.3	Jan 30, 2012	Jun 06, 2012	Mar 23, 2015	Jun 02, 2015
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring	Schedule A.15	Jan 30, 2012	Jun 07, 2012	Mar 23, 2015	May 01, 2015
BRGMON-9 Seton River Habitat and Fish Monitoring	Schedule A.16	Jan 30, 2012	Jun 07, 2012		
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement	Schedule A.5	Mar 14, 2014	May 01, 2014	Oct 21, 2014	Nov 04, 2014
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	Schedule A.8	Mar 30, 2012	Jun 27, 2012		
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program	Schedule A.1	Mar 30, 2012	Jul 24, 2012		
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	Schedule A.17	Jan 30, 2012	Apr 05, 2012		
BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed	Schedule A.18	Jan 30, 2012	Jun 26, 2012	Dec 15, 2016	Jan 20, 2017
BRGMON-15 Seton Lake Erosion Mitigation Program	Schedule A.13	Mar 30, 2012	Jul 13, 2012		
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring	Schedule A.11	Mar 30, 2012	Jul 26, 2012	Mar 19, 2013	Apr 08, 2013
BRGWORKS-1 Carpenter Revegetation	Schedule A.4	Mar 14, 2014	May 02, 2014		
BRGWORKS-2 Seton Lake Erosion	Schedule A.12	Not yet submitted			

3 Schedule

The following table outlines the current schedule for the monitoring programs and physical works being delivered for the Bridge River WUP.

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

Monitoring Programs	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11
BRGMON-1 Lower Bridge River Aquatic Monitoring	✓	✓	✓	✓	✓	■	■	■	■	■	
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring		✓		✓	✓	■	■	■		■	
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	✓	✓	✓	✓	✓	■	■	■	■	■	
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring		✓	✓	✓	✓	■	■	■	■	■	■
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring		✓									■
BRGMON-6 Seton Lake Aquatic Productivity Monitoring			✓	✓	✓						
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring		✓	✓	✓	✓	■	■	■	■	■	■
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring		✓	✓	✓	✓	■	■	■	■	■	■
BRGMON-9 Seton River Habitat and Fish Monitoring		✓	✓	✓	✓	■	■	■	■	■	■
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement				✓	✓	■					
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	✓	✓	✓		✓		■		■		
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program		✓	✓	✓	✓ ^F						
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	✓	✓	✓	✓	x ¹	■	■	■	■	■	
BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed	✓	✓	✓	✓	✓						
BRGMON-15 Seton Lake Erosion Mitigation Program		✓				■		■		■	
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring		✓	✓	✓	✓	■					
Physical Works											
BRGWORKS-1 Carpenter Revegetation			✓	✓	■	■	■	■			
BRGWORKS-2 Seton Lake Erosion				x	x ²						

- Legend:
- = Program to be undertaken/initiated in identified year
 - ✓ = Program completed for the year
 - x = Program start delayed
 - 1 = High flows in Seton River caused the program to be cancelled in 2016 due to safety and equipment concerns
 - 2 = Program start delayed due to complexities in identifying erosion sites and setting priorities.
 - ✓^F = All field work for this project is complete. No further field work is planned.
 - PCR = Project Completion Report submitted

4 Monitoring Programs and Physical Works Terms of Reference

The monitoring programs and physical works being implemented under the Bridge River WUP are described in TOR. These TORs and the reports for work completed to date can be found here:

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

5 Status of Monitoring Programs

5.1 BRGMON-1 Lower Bridge River Aquatic Monitoring

The objective of this monitoring program is to measure the functional relationship between flow release from the dam and key physical and ecological indicator variables. This program was initiated in August 2012 and will be carried out annually for ten years.

In 2016, modified operations in the Bridge River system resulted in annual average flows higher than 6 m³/sec required by the Order. These operations required a variance to the flow release for Terzaghi Dam. BC Hydro completed additional monitoring to capture the incremental impact of these higher spring-summer flows on fish, habitat and productivity. As well, additional effort was put into the regular data collection and methods associated with completing BRGMON-1 under high flow conditions. The results of this work, as well as upcoming monitoring, will provide basis for adaptive management of the current Bridge River Water Use Plan (WUP) projects to accommodate the flow changes and continue to collect data to support management questions.

The scope, budget and timelines may be subject to change to accommodate the modified operational strategy. Discussions related to operations in the Bridge River system and the flow release strategy on the Lower Bridge River are ongoing with St'at'imc and agencies.

The 2015 monitoring report is under review and will be included in the next annual report.

5.2 BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring

The objective of this monitoring program is to monitor vegetation response around the entire drawdown zone of Carpenter Reservoir, which is a vast project area with significant variability in terrain. This program was initiated in April 2013 and will be carried out at intervals over ten years.

In 2016, we had planned to submit a budget increase request to your office, which was later rescinded due to uncertainties about additional changes proposed for this study. Due to close linkages to the physical works program, BRGWORKS-1, we have determined that TOR revisions to both programs are required. TOR revisions for BRGMON-2 and BRGWORKS-1 have been prepared and are out for review. They will be submitted for approval by April 28, 2017.

Reporting for the 2013 field season is in draft and under review. No reporting was required in 2014 as no fieldwork occurred. Reporting for the 2015 field season is in draft and under review. These reports will be included in the next annual report.

5.3 BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration

The objective of this monitoring program is to evaluate effects of flow on spawning habitat, spawning distribution, and numbers of returning spawners under the alternative test flows. This information will allow interpretation of the relative aquatic productivity of the Lower Bridge River as a flow effect rather than an artefact of external factors such as abnormally low or high spawning population abundance due to changes in ocean survival. This monitoring program, which supports BRGMON-1, was initiated in August 2012 and is being implemented for ten years.

In 2016, modified operations in the Bridge River system resulted in higher annual average flows than 6 m³/sec required by the Order. These operations required a variance to the flow release for Terzaghi Dam. BC Hydro completed additional monitoring to capture the potential incremental impact of these higher spring-summer flows on steelhead spawner distribution, spawning gravel movement, and fish access to spawning grounds. As well, additional effort was put into the regular data collection and methods associated with completing BRGMON-3 under high flow conditions. The results of this work, as well as upcoming monitoring, will provide basis for adaptive management of the current Bridge River Water Use Plan (WUP) projects to accommodate the flow changes and continue to collect data to support management questions.

Methods for data collection had to be reconsidered in 2016 due to the higher spring/summer flows. The permanently installed resistivity fish counter sustained damage during the 2016 flows, so an alternative sonar technology was piloted. Preliminary results show that this sonar technology shows promise for use in future years if done in combination with other methods. Planning for 2017 field methods is currently underway.

The 2015 monitoring report dated May 27, 2016, is attached. The 2016 report is in draft and under review, and will be included in the next annual report. This report also includes findings from the high flow monitoring.

5.4 BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance and composition of the fish community in Carpenter Reservoir and Middle Bridge River. The information collected is required to link the effects of reservoir operation on fish populations and inform future decisions regarding preferred operations. This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

The 2014/15 monitoring report is in draft and under review, and will be included in the next annual report.

5.5 BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring

The objective of this monitoring program is to document the response of the riparian community surrounding the reservoir to reservoir operations and to determine if the operation has had any negative impacts on the vegetation and the overall quality of the habitat for wildlife in the area. This monitoring program was implemented in 2013 and will be implemented again in 2022.

Modified operations implemented in 2016 include maintaining Downton Reservoir at 734 m for a period of ten or more years. This is a lower maximum target reservoir elevation than originally anticipated under the WUP. Additional information will be collected in 2017 to re-establish the baseline under modified reservoir operations.

The 2013 report is under review and will be included in the next annual report.

5.6 BRGMON-6 Seton Lake Aquatic Productivity Monitoring

The objective of this monitoring program is to document the impacts of Carpenter Lake Diversion on the biological productivity of Seton Lake Reservoir. Sediment cores taken from the bottom of Seton Lake and analyzed for biological, physical, and chemical parameters will be used to reconstruct past environmental conditions in the aquatic ecosystem, thereby informing whether future operational decisions might be made to potentially mitigate impacts of the diversion. This monitoring program was initiated in 2014 and will be carried out annually over three years.

Monitoring in 2016/17 will be the final year of fieldwork for the program. Final data analysis is underway.

The 2015/16 monitoring report is in draft and under review, and will be included in the next annual report.

5.7 BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance and composition of the fish community in Downton Reservoir. The information collected is required to link the effects of reservoir operation on fish populations and inform future operational decisions. This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

Due to modified operations, which required lowering the normal maximum elevation of Downton Reservoir to 734 m, an annual assessment of fish access to creeks and tributaries for spawning has been added to this program. Currently, this work is funded outside of the CWR approved budget. We plan to seek approval to include this work within the BRGMON-7 program.

The 2015 monitoring report is still under review and will be included in the next annual report.

5.8 BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance and composition of the fish community in Seton Lake. The information collected is required to link the effects of reservoir operations on fish populations and to inform future operational decisions. This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

The 2015 monitoring report is still under review and will be included in the next annual report.

5.9 BRGMON-9 Seton River Habitat and Fish Monitoring

The objective of this monitoring program is to monitor the response of fish habitat and fish populations to Seton Dam operations. The information gained from this

study will help evaluate the selection of a preferred hydrograph, and provide information to support future operational decisions and the trade-offs with water management in other parts of the Bridge River-Seton system. This monitoring program was initiated in November 2012 with fieldwork starting in 2013, and will be carried out annually over ten years.

In 2016, operations in the Bridge River-Seton system required flows from Seton Dam into the Seton River above the targets indicated in the Order. Although excursions above the target flows as experienced in 2016 are allowed under the Order and are expected as part of normal operations, the duration of these excursions in 2016 (and expected again in 2017) have affected the ability of the study team to access certain sites on the river. BC Hydro modified the normal fieldwork plan in 2016 to allow sampling to continue at the expected flows. The results of this work, as well as upcoming monitoring, will provide basis for adaptive management of the current Bridge River Water Use Plan (WUP) projects to accommodate the flow changes and continue to collect data to support management questions.

The 2015 monitoring report dated December 23, 2016, is attached.

5.10 BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement

The objective of this monitoring program is to collect the information required to validate and refine models of the effects of reservoir operation on the biological productivity of Carpenter Reservoir. Reservoir operations drive physical conditions such as light, temperature, nutrient concentrations, and turbidity, which translate to a biological response. Using data collected under BRGMON-6, BRGMON-10 is using two types of models to determine rates of biological production in Carpenter Reservoir. The first model is a habitat model and the second is a physical/chemical model. The models are being linked together and will be used to predict the biological productivity response to reservoir operations and support future operational management decisions.

This three-year monitoring program was initiated in May 2014, and field work began in 2015/16.

The 2015/16 report is in draft form and will be submitted in the next annual report.

5.11 BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring

The objective of this monitoring program is to document the impacts of alternate flow regimes from Terzaghi Dam on the productivity of riparian vegetation and riverine birds in the Lower Bridge River. The focus of this study is on the growth of Black Cottonwoods, which are the dominant riparian vegetation along the Lower Bridge River, and riverine birds, which were considered to be key wildlife populations potentially influenced by flow on the Lower Bridge River. This monitoring program was initiated in November 2012 and will be carried out at intervals over ten years.

In 2016, modified operations in the Bridge River system resulted in higher annual average flows than 6 m³/sec required by the Order. These operations required a variance to the flow release for Terzaghi Dam. BC Hydro completed additional monitoring in 2016 to capture the incremental impact of these higher spring-summer flows on cottonwood recruitment, and riverine bird usage response. As well, additional effort was put into the regular data collection and methods associated with completing BRGMON-11 under high flow conditions. The results of this work, as well as upcoming monitoring, will provide basis for adaptive management of the current

Bridge River Water Use Plan (WUP) projects to accommodate the flow changes and continue to collect data to support management questions.

Reporting for the 2014 field season will be included in the next annual report.

5.12 BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program

The objective of this monitoring program is to document water quality and potential heavy metal contamination in the Bridge River system. It was also intended to determine if reservoir operations resulted in a change to the concentration and/or distribution of metals and other contaminants. If redistribution occurred, the program was to assess if it resulted in an increased bioaccumulation of metals and contaminants in fish in the system.

This monitoring program was initiated in May 2013 and final reporting was completed in 2016. All management questions for this program have been answered.

5.13 BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program

The objective of this monitoring program is to assess the effectiveness of powerhouse shutdowns to reduce the total entrainment mortality of sockeye salmon smolts leaving Seton Lake. This study also includes abundance, timing and biological characteristics of sockeye smolts leaving the lake, and the relationship between the dam water release and proportion of sockeye smolts through the Dam into Seton River. This monitoring program was initiated in April 2012 and will be carried out annually over ten years.

In 2016, modified operations in the Bridge River system required flows from Seton Dam into the Seton River above the targets indicated in the Order. Although excursions above the target flows as experienced in 2016 are allowed under the Order and are expected as part of normal operations, the duration of these excursions in 2016 and expected again in 2017 during the smolt outmigration have precluded safe deployment and operation of the fish traps used in this monitoring program. As a result, after several trial attempts to safely deploy and maintain the equipment, the 2016 season was cancelled.

In 2017, BC Hydro is planning a scheduled maintenance outage on the Seton Power Canal. This outage is expected to occur during the entire sockeye smolt outmigration period, and will result in zero entrainment mortalities at Seton powerhouse. Fish traps will not be operated for the purposes of this study during the outage as there is no risk of smolt entrainment through the powerhouse. Planning is underway to determine the feasibility of engineering or relocating the traps such that they can operate in a high flow situation in the future.

The 2015 monitoring report is attached. Since the 2016 season was cancelled, there will be no report for 2016 field season.

5.14 BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed

The objective of this monitoring program is to determine the effectiveness of current dam operations to ensure successful migration of adult salmon via Seton Dam to spawning grounds. The program aims to evaluate the sensitivity of salmon populations to variations in the level of Cayoosh dilution in Seton River. The program will also identify operating strategies that will mitigate delays in upstream migration

without conflicting with other water use goals for environmental protection, flood risk, and power production in the Bridge Seton generating system. The results of this program will be used to inform operational decisions at Seton Dam during the upstream migrations of salmon populations in the Seton-Anderson watersheds.

This monitoring program was initiated in August 2012. The final year of fieldwork was completed in 2016, after a TOR addendum extending the program by one extra field season was approved.

The 2015 monitoring report dated March 2016 is attached. The 2016 monitoring report will be consolidated within the final synthesis report for this program, which will be submitted in the 2018 annual report.

5.15 BRGMON-15 Seton Lake Erosion Mitigation Program Status

The objective of this monitoring program is to provide an inventory and assessment of erosion at identified sites around Seton Lake and at the Sekw'el'was Reserve adjacent to the Seton River resulting from the water level fluctuations of Seton Lake and due to the operation of BC Hydro facilities located on Seton Lake, Cayoose Creek and Seton River.

Information from this project provides a preliminary inventory and assessment of erosion sites to inform BRGWORKS-2 Seton Lake Erosion Management Program.

The first phase of this monitoring program initiated in July 2013 focused on identification of visible erosion sites including sites adjacent to areas with known heritage, cultural and aesthetic resources. The contractor worked with St'at'imc Government Services and met with St'at'imc communities in an attempt to identify sites with potential shoreline erosion risks that are in proximity to heritage and cultural resources of interest to the communities. Fieldwork for the first phase of BRGMON-15 was completed in 2014; however, BC Hydro encountered challenges with understanding how to present and use the information gathered by the study team in a report format that could be used effectively to inform the identification and prioritization of sites for potential actions.

In 2016, BC Hydro staff worked closely with staff from St'at'imc Government Services and held a series of meetings with the affected communities to discuss further planning, erosion site identification, and criteria development. For efficiency and consistency, BRGMON-15 and BRGWORKS-2 are now aligned with the BC Hydro Reservoir Archaeology Program (RAP) that shares similar objectives regarding heritage and cultural resources.

Additional meetings with St'at'imc communities are planned in 2017 to will be clarify objectives and work on prioritizing sites with St'at'imc input. Section 6.2 BRGWORKS-2 highlights additional details on the anticipated next steps.

The report from the first phase of the field program is under final review and will be submitted in the 2018 annual report.

5.16 BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring

The objective of this monitoring program is to assess the response of St'at'imc spiritual and cultural values to the flow regime on the Lower Bridge River. This monitoring program was initiated in spring of 2013 and will be carried out over five years.

In 2016, modified operations in the Bridge River system resulted in annual average flows higher than 6 m³/sec. These operations required a variance to the flow release for Terzaghi Dam. The BRGMON-16 summer field survey coincided with the peak flow in the Lower Bridge River. The results of this work, as well as upcoming monitoring, will provide basis for adaptive management of the current Bridge River Water Use Plan (WUP) projects.

The 2015 monitoring report dated January 12, 2016, is attached. The 2016 monitoring report will be included in the next annual report.

6 Status of Physical Works

6.1 BRGWORKS-1 Carpenter Re-vegetation

This physical works program currently requires a 5-year planting program to vegetate an approximately 400 ha area of the Carpenter Reservoir drawdown zone between Tyaughton Lake Road Junction and the Gun Creek Fan. The intent of this planting program was to 'kick-start' natural recolonization of vegetation in the reservoir. This six-year physical works program was initiated in 2014.

Experience gained from similar programs in BC and results to date have demonstrated that a re-vegetation approach based strictly on planting is unlikely to succeed. Other approaches such as physical manipulation of substrate in the area may be better suited to promote natural re-colonization of vegetation in the long term. BRGWORKS-1 is moving toward this new approach.

Due to close linkages to the monitoring program BRGMON-2, we have determined that TOR revisions to both programs are required. TOR revisions for BRGMON-2 and BRGWORKS-1 have been prepared for review.

The 2014 and 2015 reports (dated March 2015 and January 2017, respectively) are attached.

6.2 BRGWORKS-2 Seton Lake Erosion

This physical works has not yet been initiated.

As indicated in Section 5.15 the information regarding the identification of erosion sites including sites adjacent to areas with known heritage, cultural and aesthetic resources from BRGMON-15 Seton Lake Erosion Mitigation Program will inform plans for mitigation at priority sites as identified by BC Hydro in consultation with St'at'imc communities.

The ongoing community discussions scheduled in 2017 and results of BRGMON-15 to date will inform the development of a Terms of Reference (TOR) for BRGWORKS-2. The TOR will set out to determine the feasibility of mitigation options at priority erosion sites. The findings of this initial feasibility work will identify mitigation options for review by BC Hydro and St'at'imc communities and will further inform future phases of work. This initial TOR submission will also seek to expedite actions to address already known risks identified by BC Hydro and St'at'imc such as the erosion on Seton River identified adjacent to a house pit (heritage site) on the Sekw'el'was Reserve.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Bridge River WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to January 31, 2017.

Table 7-1: Bridge River 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
Bridge River WUP Annual Report	\$17,703	\$5,664	\$12,040	\$17,703	\$0		
BRGM01A Low Bridge R Aquatic - OR	\$2,126,171	\$1,347,154	\$882,962	\$2,230,116	(\$103,945)	Ongoing work for the flow release strategy	Resubmit TOR once a flow strategy is determined.
BRGM01A Low Bridge R Aquatic - OR DM	\$92,854	\$57,296	\$50,922	\$108,218	(\$15,364)		
BRGM01A Low Bridge R Aquatic - OR Imp	\$2,033,317	\$1,289,859	\$832,040	\$2,121,899	(\$88,582)		
BRGM02A Carpenter Rse Riparia	\$412,706	\$246,908	\$303,501	\$550,409	(\$137,703)	Higher than expected photogrammetry costs in Year 1 and vast size of project area. Future photogrammetry costs are expected to be lower.	Resubmit TOR by April 28, 2017
BRGM02A Carpenter Rse Riparia - OR DM	\$65,857	\$41,253	\$36,584	\$77,836	(\$11,979)		
BRGM02A Carpenter Rse Riparia - OR Imp	\$346,849	\$205,655	\$266,917	\$472,573	(\$125,724)		
BRGM03A Low BR Salmon & Steel	\$1,975,352	\$1,343,498	\$787,010	\$2,130,508	(\$155,156)	Ongoing work for the flow release strategy	Resubmit TOR once a flow strategy is determined.
BRGM03A Low BR Salmon & Steel - OR DM	\$92,722	\$35,123	\$42,878	\$78,001	\$14,721		
BRGM03A Low BR Salmon & Steel - OR Imp	\$1,882,630	\$1,308,375	\$744,131	\$2,052,507	(\$169,877)		
BRGM04A Carp Rse&Mld BR Fish	\$1,843,675	\$665,722	\$933,290	\$1,599,012	\$244,663		
BRGM04A Carp Rse&Mld BR Fish - OR DM	\$98,053	\$21,587	\$31,382	\$52,969	\$45,084		
BRGM04A Carp Rse&Mld BR Fish - OR Imp	\$1,745,622	\$644,134	\$901,908	\$1,546,043	\$199,579		
BRGM05A Downton Rse Riparian	\$355,756	\$169,359	\$203,827	\$373,186	(\$17,430)	Ongoing work for the flow release strategy	Resubmit TOR once a flow strategy is determined.
BRGM05A Downton Rse Riparian - OR DM	\$26,922	\$8,873	\$21,995	\$30,868	(\$3,946)		
BRGM05A Downton Rse Riparian - OR Imp	\$328,834	\$160,486	\$181,832	\$342,318	(\$13,484)		
BRGM06A Seton Lake Aquatic Pr	\$1,319,947	\$1,233,680	\$41,043	\$1,274,722	\$45,225		
BRGM06A Seton Lake Aquatic Pr - OR DM	\$32,524	\$20,947	\$8,988	\$29,935	\$2,589		
BRGM06A Seton Lake Aquatic Pr - OR Imp	\$1,287,423	\$1,212,733	\$32,055	\$1,244,787	\$42,636		
BRGM07A Downton Rse Fish Habi	\$1,063,401	\$372,200	\$657,613	\$1,029,813	\$33,588		
BRGM07A Downton Rse Fish Habi - OR DM	\$87,909	\$21,763	\$38,259	\$60,022	\$27,887		
BRGM07A Downton Rse Fish Habi - OR Imp	\$975,492	\$350,437	\$619,354	\$969,791	\$5,701		
BRGM08A Seton Fish Hab & Pop	\$947,702	\$338,833	\$572,840	\$911,673	\$36,029		
BRGM08A Seton Fish Hab & Pop - OR DM	\$85,780	\$14,690	\$36,352	\$51,042	\$34,738		
BRGM08A Seton Fish Hab & Pop - OR Imp	\$861,922	\$324,143	\$536,488	\$860,631	\$1,291		
BRGM09A Seton R Habitat & Fis	\$1,185,918	\$496,266	\$695,126	\$1,191,392	(\$5,474)	Higher than expected implementation costs.	Resubmit TOR prior to final year when costs can be assessed. Cost efficiencies may be available.
BRGM09A Seton R Habitat & Fis - OR DM	\$85,924	\$13,084	\$38,984	\$52,067	\$33,857		
BRGM09A Seton R Habitat & Fis - OR Imp	\$1,099,994	\$483,182	\$656,142	\$1,139,324	(\$39,330)		
BRGM10A Carp Rse Prod Model	\$995,981	\$778,915	\$230,867	\$1,009,782	(\$13,801)	Higher than expected implementation costs.	Resubmit TOR prior to final year when costs can be assessed. Cost efficiencies may be available.
BRGM10A Carp Rse Prod Model - OR DM	\$23,991	\$17,309	\$9,345	\$26,654	(\$2,663)		
BRGM10A Carp Rse Prod Model - OR Imp	\$971,990	\$761,606	\$221,522	\$983,127	(\$11,137)		
BRGM11A Low BR Riparian Vege	\$567,076	\$387,649	\$322,192	\$709,842	(\$142,766)	Higher than expected photogrammetry costs in Year 1 and ongoing work supporting the flow release strategy. Future photogrammetry costs are expected to be lower.	Resubmit TOR once a flow strategy is determined.
BRGM11A Low BR Riparian Vege - OR DM	\$33,052	\$27,631	\$40,088	\$67,719	(\$34,667)		
BRGM11A Low BR Riparian Vege - OR Imp	\$534,024	\$360,018	\$282,105	\$642,123	(\$108,099)		
BRGM12A Bridge-Seton Metals	\$481,257	\$117,132	\$11,897	\$129,029	\$352,228	Efficiencies found during project implementation.	
BRGM12A Bridge-Seton Metals - OR DM	\$65,889	\$12,694	\$11,897	\$24,591	\$41,298		
BRGM12A Bridge-Seton Metals - OR Imp	\$415,368	\$104,438	\$0	\$104,438	\$310,930		
BRGM13A Seton Powerhouse	\$1,958,221	\$839,595	\$985,458	\$1,825,054	\$133,167		
BRGM13A Seton Powerhouse - OR DM	\$89,289	\$34,668	\$40,881	\$75,549	\$13,740		
BRGM13A Seton Powerhouse - OR Imp	\$1,868,932	\$804,928	\$944,577	\$1,749,505	\$119,427		
BRGM14A Cayoosh Flow Dilutio	\$2,323,768	\$2,065,242	\$238,125	\$2,303,367	\$20,401		
BRGM14A Cayoosh Flow Dilutio - OR DM	\$53,097	\$36,864	\$16,438	\$53,302	(\$205)		
BRGM14A Cayoosh Flow Dilutio - OR Imp	\$2,270,671	\$2,028,378	\$221,687	\$2,250,065	\$20,606		
BRGM15A SON Erosion Mitigate	\$184,648	\$114,285	\$318,959	\$433,243	(\$248,595)	Estimated costs are for the entire study period, but the approved budget is currently for the first phase only.	Submit TOR for remaining phases of work upon completion of first phase.
BRGM15A SON Erosion Mitigate - OR DM	\$17,403	\$27,825	\$33,494	\$61,319	(\$43,916)		
BRGM15A SON Erosion Mitigate - OR Imp	\$167,245	\$86,459	\$285,465	\$371,924	(\$204,679)		
BRGM16A Spiritual & Cultural	\$495,211	\$303,505	\$165,803	\$469,309	\$25,902		
BRGM16A Spiritual & Cultural - OR DM	\$44,246	\$16,522	\$12,035	\$28,557	\$15,689		
BRGM16A Spiritual & Cultural - OR Imp	\$450,965	\$286,984	\$153,768	\$440,752	\$10,213		
BRGW01A Carp Re-Vegetation	\$1,329,224	\$680,896	\$543,589	\$1,224,485	\$104,739		
BRGW01A Carp Re-Vegetation - OR DM	\$55,986	\$48,669	\$20,890	\$69,559	(\$13,573)		
BRGW01A Carp Re-Vegetation - OR Imp	\$1,273,238	\$632,226	\$522,699	\$1,154,925	\$118,313		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.