

Bridge River Water Use Plan Monitoring Program and Physical Works

Annual Report: 2021

Implementation Period: February 2020 to January 2021

- **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-11A Lower Bridge River Riparian Vegetation Monitoring**
- **BRGMON-11B Lower Bridge River Riverine Wildlife 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 26, 2021

BC Hydro Bridge River Project Water Use Plan Monitoring Programs and Physical Works Annual Report: 2021

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, 2021, as per the Bridge River Order under the *Water Act*, dated March 30, 2011. There are 17 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 Comptroller of Water Rights (CWR).

Table: 2-1: Dates of Bridge River WUP TOR Submissions and Approvals by the CWR

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.9	Jan 30, 2012	Apr 12, 2012	Nov 30, 2018	Feb 05, 2019
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring	Schedule A.6	Jan 30, 2012	Jun 26, 2012	Mar 06, 2017	Mar 21, 2017
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	Schedule A.10	Jan 30, 2012	Feb 07, 2012	Nov 30, 2018	Jan 02, 2019
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	May 20, 2020	May 29, 2020
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-11A Lower Bridge River Riparian Vegetation Monitoring	Schedule A.8	Nov 30, 2018	Jan 25, 2019		
BRGMON-11 B Lower Bridge River Riverine Wildlife Monitoring	Schedule A.8	Nov 30, 2018	Jan 25, 2019		
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	Feb 07, 2020	Feb 21, 2020
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	Nov 30, 2017	Dec 15, 2017
BRGMON-15 Seton Lake Erosion Mitigation Program	Schedule A.13	Mar 30, 2012	Jul 13, 2012	Nov 09, 2020	Nov 20, 2020
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	Mar 06, 2017	Mar 21, 2017
BRGWORKS-2 -Seton Erosion Management Projects	Schedule A.12	Nov 29, 2019	Dec 10, 2019	Apr 22, 2020	May 12, 2020

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, 2021

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			✓	✓	✓	✓F					
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				✓	✓	✓F					
BRGMON-11A Lower Bridge River Riparian Vegetation Monitoring	✓				✓					■	
BRGMON-11B Lower Bridge River Riverine Wildlife Monitoring	✓	✓	✓		✓		✓		✓F		
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program		✓	✓	✓	✓F						
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	✓	✓	✓	✓	x	✓	✓	✓	✓	■	
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	✓	✓	✓	✓	✓	✓	✓F				
BRGMON-15 Seton Lake Erosion Mitigation Program		✓				x	✓	✓	✓	■	■
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring			✓	✓	✓	✓	✓F				
Physical Works											
BRGWORKS-1 Carpenter Revegetation			✓	✓	✓	✓		✓	✓		
BRGWORKS-2 Seton Erosion								✓		■	■

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

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.BC Hydro.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 BRGMON-1 is to quantify the response of key physical and biological indicators in the Lower Bridge River to different instream flow regimes to better understand which variables explain changes observed in aquatic productivity.

This program was initiated in August 2012 and is carried out annually for ten years.

From 2016 to 2018 BC Hydro implemented modified operations at Downton Reservoir for dam safety reasons and conducted major capital improvements at Bridge River 1 and 2 powerhouses that required extensive planned outages. This resulted in having a variance approved by CWR to allow discharges down the Lower Bridge River during freshet that were higher than the WUP Ordered operations. To plan for and better assess the impact of these operations, additional monitoring complementary to BRGMON-1 WUP monitoring was added (not included in WUP expenditures) and the results of both programs are integrated into the same report.

Though there were no high flows in 2019 and 2020, additional non-WUP monitoring continued including extending the aquatic productivity measurements and standing stock surveys into Reach 1 of the Lower Bridge River, to better enable comparisons against possible future high flow years. Additionally, mitigation effectiveness monitoring was carried out at the Applesprings and Bluenose side channels to assess salmonid habitat use of these sites.

The monitoring reports from 2019 (Year 8) and 2020 (Year 9) will be submitted with the 2022 Annual Report.

5.2 BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring

The objectives of the BRGMON-2 monitoring program are:

- To monitor the effects of Carpenter Reservoir operations on vegetation response (including substrates and natural revegetation) within the drawdown zone of Carpenter Reservoir, and
- To monitor the effectiveness of revegetation treatments in the Gun Creek Fan and adjacent area, completed under the physical works program BRGWORKS-1.

This program was initiated in April 2013 and will be carried out at intervals over ten years. No monitoring is scheduled in 2021 as per TOR with the final monitoring year in 2022.

Attached is the 2019 (Year 7) monitoring report dated August 13, 2020.

The 2020 report is in draft and under review to be submitted with the 2022 Annual Report.

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

The main objective of the BRGMON-3 monitoring program is to provide rigorous estimates of the abundance and distribution of salmon and steelhead spawning

in the Lower Bridge River. The BRGMON-3 program will also address data gaps associated spawning timing, spawning distribution, and spawning habitat quality and quantity.

This monitoring program was initiated in August 2012 and is being implemented annually for ten years.

From 2016 to 2018 BC Hydro implemented modified operations at Downton Reservoir for dam safety reasons and conducted major capital improvements at Bridge River 1 and 2 powerhouses that required extensive planned outages. This resulted having a variance approved by CWR to allow discharges down the Lower Bridge River during freshet that were higher than the WUP Ordered operations. To plan for and better assess the impact of these operations, additional monitoring complementary to BRGMON-3 WUP monitoring was added (not included in WUP expenditures) and the results of both programs are integrated into the same report.

Though there were no high flows in 2019 and 2020, additional non-WUP monitoring continued including an increased effort associated with stream walks and repeat habitat surveys.

The 2019 (Year 8) monitoring report dated February 24, 2021 is attached.

The 2020 (Year 9) report will be included in the 2022 Annual Report.

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 to determine whether there is a relationship between operating parameters and productivity.

This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

The 2019 (Year 7) monitoring report dated March 1, 2020 is attached. The 2020 (Year 8) report is in draft and under review and will be included in the 2022 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 on the Upper Bridge River Fan and in the immediate adjacent drawdown zone of Downton Reservoir to determine if reservoir operations have had a negative impact on riparian 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.

In 2016 for dam safety reasons, the normal maximum elevation of Downton Reservoir was lowered by 16 vertical metres from 750 m to 734 m and has been maintained since. In 2018, vegetation monitoring in the zone between 734m and 750m was implemented. This additional year was not included in the WUP expenditures and was covered in a separate report

The 2018 non-WUP report dated September 8, 2020 is attached.

5.6 BRGMON-6 Seton Lake Aquatic Productivity Monitoring

The objective of this monitoring program was 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 were analyzed for biological, physical, and chemical parameters 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 was carried out annually over three years. The final field season was completed in 2016.

This project is complete.

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.

In 2016 for dam safety reasons, the normal maximum elevation of Downton Reservoir was lowered by 16 vertical metres from 750 m to 734 m and has been maintained since. An annual assessment of fish access to creeks and tributaries for spawning was added to this program (not included in WUP expenditures) and the results of both programs are integrated into the same report.

The 2019 (Year 7) monitoring report is in draft and under review and will be included in the 2022 Annual Report along with the 2020 (Year 8) monitoring 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 to establish whether there are links to reservoir operations on fish populations.

This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

The 2019 (Year 7) monitoring report is in draft and under review and will be included in the 2022 Annual Report along with the 2020 (Year 8) monitoring 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.

This monitoring program was initiated in November 2012 with fieldwork starting in 2013 and will be carried out annually over ten years.

In 2019, as part of Addendum 1, additional monitoring in the Lower Fraser was added to the project and is reported in a separate monitoring report. In 2020, minor additional non-WUP monitoring continued. This additional monitoring is complementary to BRGMON-9 WUP monitoring (not included in WUP expenditures) and the results of both programs are integrated into the same report.

The primary BRGMON-9 monitoring report for 2019 (Year 7) dated August 31, 2020 is attached. The 2020 (Year 8) monitoring report will be submitted with the 2022 Annual Report.

The 2020 (Year 2 of Addendum 1) report for the Lower Fraser River Stranding Assessment is in draft and under review and will be submitted with the 2022 Annual Report.

5.10 BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement

The objective of this monitoring program was 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 used two types of models to determine rates of biological production in Carpenter Reservoir. The first model was a habitat model and the second was a physical/chemical model. The models were linked together to predict the biological productivity response to reservoir operations.

This monitoring program was initiated in May 2015 and was implemented over 3 years to 2017.

This project is complete.

5.11 BRGMON-11A Lower Bridge River Riparian Vegetation Monitoring

The objective of the BRGMON-11A monitoring is to quantify the response of key physical and biological indicators in the Lower Bridge River to different instream flow regimes to determine which variables explain any changes in the riparian community. Note that the first year of BRGMON-11A project was reported in a combined report with BRGMON-11B under BRGMON-11. This WUP monitoring program was initiated in 2012 and implemented again in 2016. The next implementation year is 2021.

From 2016 to 2018 BC Hydro implemented modified operations at Downton Reservoir for dam safety reasons and conducted major capital improvements at Bridge River 1 and 2 powerhouses that required extensive planned outages. This resulted having a variance approved by CWR to allow discharges down the Lower Bridge River during freshet that were higher than the WUP Ordered operations. To plan for and better assess the impact of these operations, two additional years of vegetation monitoring (2017 and 2018) on the Lower Bridge River that were complementary to BRGMON-11A WUP monitoring were added

(not included in WUP expenditures). The results of this non-WUP monitoring are presented in separate monitoring reports.

The 2018 non-WUP monitoring report dated January 9, 2020 is attached.

5.12 BRGMON-11B Lower Bridge River Riverine Wildlife Monitoring

The objective of the BRGMON-11B monitoring program is to document how riverine and riparian wildlife in the Lower Bridge River respond to alternate flow regimes.

This monitoring program was initiated in November 2012 and will be carried out at intervals over ten years. Note that the first three years of BRGMON-11B project was reported in a combined report with BRGMON-11A under BRGMON-11.

From 2016 to 2018 BC Hydro implemented modified operations at Downton Reservoir for dam safety reasons and conducted major capital improvements at Bridge River 1 and 2 powerhouses that required extensive planned outages. This resulted having a variance approved by CWR to allow discharges down the Lower Bridge River during freshet that were higher than the WUP Ordered operations. To plan for and better assess the impact of these operations, an additional non-WUP field year was added in 2019 (not included in WUP expenditures). The results of this non-WUP monitoring are presented in a separate monitoring report dated May 31, 2020 which is attached. An additional 2019 non-WUP report on the protection of Cottonwoods on the Lower Bridge River, dated March 4, 2020 is also attached.

The final scheduled WUP year of field work was 2020 and included riverine bird and beaver surveys. The 2020 monitoring report will be included in the 2022 Annual Report.

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

The objective of this monitoring program was 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.

This project is complete.

5.14 BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program

The objective of this monitoring program is to assess the effectiveness of Seton 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 Seton Dam into Seton River.

This monitoring program was initiated in April 2012 and was carried out annually to 2015. In 2016 monitoring was suspended due to safety and equipment concerns from the Seton River peak flows. In 2016, trials were implemented to test the durability and suitability of alternate equipment configurations to ensure crews could operate the equipment safely and efficiently under the higher peak flows.

In February 2020 the CWR approved TOR Addendum 1 for this study. The TOR Addendum extended the sampling window and added radio telemetry tagging to the field program. With these additions, two more years of field work were expected for 2020 and 2021. However, there were challenges with the radio tagging program in 2020 including a relatively high proportion of mortalities among the tagged smolts that impacted the quality of data collected. With these results, along with expected shut down of Seton Generating Station for maintenance in 2021, BC Hydro is considering further methodological changes for the 2021 field season.

The 2019 (Year 7) and 2020 (Year 8) monitoring reports are in draft and under review and will be submitted in the 2022 Annual Report.

5.15 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.
- Alternative 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 original monitoring program was initiated in August 2012 and concluded in 2016. The final monitoring report for the 2012 to 2016 program dated April 30, 2020 is attached.

On December 15, 2017, the CWR approved Addendum 1 for BRGMON-14 to test alternative siphon scenarios at Seton Dam by extending enumeration of the Gates Creek Sockeye for up to an additional four years (2017-2020) with a re-assessment after each field season. After Year 2 of 4 (2018), BC Hydro concluded that the accuracy of post-passage survival estimates was not sufficient to differentiate between routine and alternative Seton Dam Operations and therefore decided against continuing the study beyond 2018.

The 2018 (Year 7) monitoring report for the Seton Dam component dated March 1, 2019 is attached.

5.16 BRGMON-15 Seton Erosion Management Project: Phases 1 and 3

The overall objective of both Seton Erosion Management Projects (BRGMON-15 and BRGWORKS-2) is to identify and manage the priority high and moderate risk shoreline and riverbank erosion sites that are impacted by the operation of the Bridge-Seton Generation facilities. The erosion sites may be adjacent to heritage, cultural and aesthetic resources, and other non-heritage sites on Seton Lake and Seton River.

Phase 1 includes identifying sites and determining the appropriate options to manage the erosion. Options may include mitigation (Phase 2) and/or may involve monitoring – depending on the particular risks and characteristics of the site. Subsequent implementation of mitigation plans would be carried out under BRGWORKS-2 Seton Erosion Management Projects: Site Specific Mitigation Physical Works.

Field work was completed in 2013 and 2014 on Seton Lake and on Seton River in 2015 and 2016. Following community meetings in 2018 and 2019, St'át'imc communities identified new sites and field visits were conducted in August 2019.

On November 20, 2020 a TOR Revision 1 was approved by the CWR that clarified the alignment to the WUP Order clauses, reflected changes to methods and approach and included scope and budget for Phase 3 monitoring.

The report for Phase 1 dated October 21, 2020 (related to the 2013 and 2014 field work on Seton Lake) was submitted along with the TOR Revision. Additionally, reports related to work on Seton River, not funded by the WUP project, but relevant to the updated scope of BRGMON-15 TOR Revision 1 were also submitted to the CWR at that time.

A conceptual design report for three sites on Seton Lake is currently in draft and under review.

We continue to work with St'át'imc to develop the full shortlist of shoreline erosion sites considered for mitigation under Phase 2 (BRGWORKS 2) or monitoring under Phase 3 (BRGMON-15).

Additionally, Phase 3 monitoring of sites on the Seton River is expected to be completed in 2021.

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

The objective of this monitoring program was to assess the response of St'át'imc spiritual and cultural values to the flow regime on the Lower Bridge River.

This monitoring program was initiated in spring of 2014 and was carried out over five years ending in 2018.

The reports for 2016 (Year 3) dated June 19, 2020; 2017 (Year 4) dated January 1, 2021; and the 2018 (Year 5) final program report dated February 1, 2021 are attached.

This project is complete.

6 Status of Physical Works

6.1 BRGWORKS-1 Carpenter Re-vegetation

The objective of this physical work program is to vegetate an approximately 400 ha area of the Carpenter Reservoir drawdown zone between Tyaughton Lake Road Junction and the Gun Creek Fan. Monitoring the effectiveness of this physical works program is undertaken as part of the BRGMON-2: Carpenter Reservoir Riparian Vegetation Monitoring.

This program was initiated in 2014 and was carried out in intervals until 2020.

In 2020, the final year of the planting program was completed which included seeding, live staking, and substrate mounding.

Attached is the 2019 (Year 5) report dated March 20, 2020. The 2020 (Year 6) draft report is currently being reviewed and will be submitted in the 2022 Annual Report.

6.2 BRGWORKS-2 Seton Erosion Management Projects – Site-specific Mitigation Physical Works

The objective of this project is to implement the mitigation plans for erosion protection of the priority sites as developed under the related (Phase 1) BRGMON-15 project.

On May 12, 2020 the CWR approved the TOR for BRGWORKS-2 to advance mitigation at the first site on the Seton River. Survey work is proceeding to validate the design prior to additional design work.

As mentioned in BRGMON-15 above, further submissions for mitigation work on Seton Lake are expected before the next Annual Report.

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, 2021.

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
BRG Prepare Annual Report	\$25,112	\$15,616	\$7,225	\$22,841	\$2,271		
BRGM01A Low Bridge R Aquatic	\$3,427,450	\$2,673,307	\$513,895	\$3,187,202	\$240,248	Efficiencies are expected for the remaining years of the project.	
BRGM01A Low Bridge R Aquatic - OR DM	\$123,735	\$115,549	\$19,559	\$135,107	(\$11,372)		
BRGM01A Low Bridge R Aquatic - OR Imp	\$3,303,715	\$2,553,152	\$494,336	\$3,047,489	\$256,226		
BRGM02A Carpenter Rse Riparia	\$778,013	\$553,522	\$189,751	\$743,273	\$34,740	Efficiencies found during project implementation.	
BRGM02A Carpenter Rse Riparia - OR DM	\$81,253	\$73,513	\$14,863	\$88,375	(\$7,122)		
BRGM02A Carpenter Rse Riparia - OR Imp	\$696,760	\$480,009	\$174,889	\$654,898	\$41,862		
BRGM03A Low BR Salmon & Steel	\$3,537,716	\$2,735,223	\$697,711	\$3,432,934	\$104,782	Efficiencies are expected for the remaining years of the project.	
BRGM03A Low BR Salmon & Steel - OR DM	\$87,650	\$84,036	\$21,906	\$105,942	(\$18,292)		
BRGM03A Low BR Salmon & Steel - OR Imp	\$3,450,066	\$2,651,187	\$675,805	\$3,326,992	\$123,074		
BRGM04A Carp Rse&Mld BR Fish	\$1,843,675	\$1,337,723	\$458,026	\$1,795,749	\$47,926	Efficiencies found during project implementation.	
BRGM04A Carp Rse&Mld BR Fish - OR DM	\$98,053	\$44,604	\$23,717	\$68,321	\$29,732		
BRGM04A Carp Rse&Mld BR Fish - OR Imp	\$1,745,622	\$1,293,119	\$434,309	\$1,727,428	\$18,194		
BRGM05A Downton Rse Riparian	\$355,756	\$181,761	\$164,489	\$346,250	\$9,506		
BRGM05A Downton Rse Riparian - OR DM	\$26,922	\$21,240	\$22,431	\$43,671	(\$16,749)		
BRGM05A Downton Rse Riparian - OR Imp	\$328,834	\$160,521	\$142,058	\$302,579	\$26,255		
BRGM06A Seton Lake Aquatic Pr	\$1,319,947	\$1,269,557		\$1,269,557	\$50,390	Project completed.	
BRGM06A Seton Lake Aquatic Pr - OR DM	\$32,524	\$24,224		\$24,224	\$8,300		
BRGM06A Seton Lake Aquatic Pr - OR Imp	\$1,287,423	\$1,245,333		\$1,245,333	\$42,090		
BRGM07A Downton Rse Fish Habi	\$1,063,401	\$797,519	\$245,350	\$1,042,869	\$20,532	Efficiencies found during project implementation.	
BRGM07A Downton Rse Fish Habi - OR DM	\$87,909	\$43,178	\$30,652	\$73,830	\$14,079		
BRGM07A Downton Rse Fish Habi - OR Imp	\$975,492	\$754,341	\$214,697	\$969,038	\$6,454		
BRGM08A Seton Fish Hab & Pop	\$947,702	\$661,144	\$265,231	\$926,375	\$21,327	Efficiencies found during project implementation.	
BRGM08A Seton Fish Hab & Pop - OR DM	\$85,780	\$32,924	\$31,529	\$64,453	\$21,327		
BRGM08A Seton Fish Hab & Pop - OR Imp	\$861,922	\$628,220	\$233,702	\$861,922			
BRGM09A Seton R Habitat & Fis	\$1,672,664	\$1,133,740	\$506,706	\$1,640,446	\$32,218	Efficiencies found during project implementation.	
BRGM09A Seton R Habitat & Fis - OR DM	\$72,067	\$58,373	\$34,971	\$93,344	(\$21,277)		
BRGM09A Seton R Habitat & Fis - OR Imp	\$1,600,597	\$1,075,368	\$471,735	\$1,547,103	\$53,494		
BRGM10A Carp Rse Prod Model	\$995,981	\$995,904		\$995,904	\$77	Project completed.	
BRGM10A Carp Rse Prod Model - OR DM	\$23,991	\$26,470		\$26,470	(\$2,479)		
BRGM10A Carp Rse Prod Model - OR Imp	\$971,990	\$969,434		\$969,434	\$2,556		
BRGM11A Low BR Riparian Vege	\$694,899	\$357,414	\$336,825	\$694,239	\$660		
BRGM11A Low BR Riparian Vege - OR DM	\$55,213	\$60,900	\$20,825	\$81,725	(\$26,512)		
BRGM11A Low BR Riparian Vege - OR Imp	\$639,686	\$296,514	\$316,000	\$612,514	\$27,172		
BRGM11B Low BR Riverine Wild	\$237,723	\$136,055	\$80,250	\$216,305	\$21,418		
BRGM11B Low BR Riverine Wild - OR DM	\$20,837	\$2,832	\$17,369	\$20,201	\$636		
BRGM11B Low BR Riverine Wild - OR IMP	\$216,886	\$133,222	\$62,881	\$196,104	\$20,782		
BRGM12A Bridge-Seton Metals	\$481,257	\$117,247		\$117,247	\$364,010	Project completed.	
BRGM12A Bridge-Seton Metals - OR DM	\$65,889	\$12,809		\$12,809	\$53,080		
BRGM12A Bridge-Seton Metals - OR Imp	\$415,368	\$104,438		\$104,438	\$310,930		
BRGM13A Seton Powerhouse	\$2,241,459	\$1,748,604	\$269,884	\$2,018,488	\$222,971	Seton powerhouse shutdown resulting less labour required for 2021 program. Expected to spend less than TOR.	
BRGM13A Seton Powerhouse - OR DM	\$113,881	\$94,848	\$26,363	\$121,211	(\$7,330)		
BRGM13A Seton Powerhouse - OR Imp	\$2,127,578	\$1,653,756	\$243,521	\$1,897,277	\$230,301		
BRGM14A Cayoosh Flow Dilutio	\$2,564,557	\$2,409,441	\$5,000	\$2,414,441	\$150,116	Budget provided option to extend to 2021 but ended in 2018. Project completed.	
BRGM14A Cayoosh Flow Dilutio - OR DM	\$66,600	\$54,591		\$54,591	\$12,009		
BRGM14A Cayoosh Flow Dilutio - OR Imp	\$2,497,957	\$2,354,850	\$5,000	\$2,359,850	\$138,107		
BRGM15A SON Erosion Mitigate	\$1,027,670	\$310,711	\$703,507	\$1,014,217	\$13,453		
BRGM15A SON Erosion Mitigate - OR DM	\$224,463	\$100,989	\$137,821	\$238,811	(\$14,348)		
BRGM15A SON Erosion Mitigate - OR Imp	\$803,207	\$209,721	\$565,686	\$775,407	\$27,800		
BRGM16A Spiritual & Cultural	\$495,211	\$468,772	\$10,173	\$478,945	\$16,266		
BRGM16A Spiritual & Cultural - OR DM	\$44,246	\$30,681	\$173	\$30,854	\$13,392		
BRGM16A Spiritual & Cultural - OR Imp	\$450,965	\$438,091	\$10,000	\$448,091	\$2,874		
BRGW01A Carp Re-Vegetation	\$1,329,224	\$1,256,218	\$49,886	\$1,306,104	\$23,120	efficiencies found during project implementation	
BRGW01A Carp Re-Vegetation - OR DM	\$55,986	\$94,229	\$2,535	\$96,764	(\$40,778)		
BRGW01A Carp Re-Vegetation - OR Imp	\$1,273,238	\$1,161,989	\$47,351	\$1,209,339	\$63,899		
BRGW02A SON Erosion Control	\$1,196,621	\$96,668	\$1,099,953	\$1,196,621	\$0		
BRGW02A SON Erosion Control - OR DM	\$180,710	\$52,550	\$128,160	\$180,710			
BRGW02A SON Erosion Control - OR Imp	\$1,015,911	\$44,117	\$971,794	\$1,015,911			

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.