Campbell River Water Use Plan

Monitoring Program and Physical Works

Annual Report: 2016

Implementation Period: October 2015 to September 2016

- **JHTMON-1 Upper and Lower Campbell Lake Reservoir Digital Elevation Model**
- **JHTMON-2 Upper and Lower Campbell and John Hart Reservoirs Public Use and Perception Survey**
- **JHTMON-3 Upper and Lower Campbell Lake Fish Spawning Success Assessment**
- **JHTMON-4 Upper and Lower Campbell Lake Reservoirs Littoral Productivity Assessment**
- **JHTMON-5 Campbell Reservoirs Littoral vs. Pelagic Fish Production Assessment**
- **JHTMON-6 Campbell Watershed Riverine Fish Production Assessment**
- **JHTMON-7 Campbell River Watershed Riverine Fish Rearing**
- **JHTMON-8 Quinsam and Salmon Rivers Smolt and Spawner Abundance Assessment**
- **JHTMON-9 Upper and Lower Campbell Lake Reservoir Amphibian Assessment**
- **JHTMON-10 Upper and Lower Campbell Lake Reservoirs Shoreline Vegetation Model Validation**
- **JHTMON-11 Upper Campbell Lake Reservoir Erosion Assessment**
- **JHTMON-12 Salmon River Diversion Erosion Monitoring**
- **JHTMON-13 Lower Campbell River Ramping and Tripping Physical Model and Assmt**
- **JHTMON-14 Lower Campbell River Load Factoring Fisheries Assessment**
- **JHTMON-15 Elk Canyon Smolt and Spawner Abundance Assessment**
- **JHTWORKS-1 Upper Campbell Lake Erosion Control**
- **JHTWORKS-2 Upper and Lower Campbell Lake Recreation Facility Redevelopment**
- **JHTWORKS-3 Upper Campbell Drawdown Zone Revegetation program**
- **JHTWORKS-4 Sayward Canoe Route (Portage and Signage)**
- **JHTWORKS-5 Salmon River Diversion, Fry Creek Erosion Control**
- **JHTWORKS-6 Salmon River Diversion Fish Screen Upgrade**

For Water Licences 126726, 126725, 126722, 126724, 126713, 126721, 126751, 126727, 126757, 126764, 126759, 126765, 126761 and Conditional Water Licence 23265

October 31, 2016

BC Hydro Campbell River Project Water Use Plan Monitoring Programs and Physical Works Annual Report: 2016

1 Introduction

This document represents a summary of the status and the results of the Campbell River Water Use Plan (WUP) monitoring programs and physical works to September 30, 2016, as per the Campbell River Order under the *Water Act*, dated November 21, 2012. There are thirteen monitoring programs and six physical works.

2 Status

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

Table: 2-1: Dates of Campbell 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
JHTMON-1 Upper and Lower Campbell Lake Reservoir Digital Elevation Model		To be submitted Mar 31, 2017			
JHTMON-2 Upper and Lower Campbell and John Hart Reservoirs Public Use and Perception Survey	Schedule C.2.b, Schedule D.1.c, Schedule E.2	Sep 26, 2013	Oct 08, 2013		
JHTMON-3 Upper and Lower Campbell Lake Reservoirs Fish Spawning Success Assessment	Schedule C.3.a, Schedule D.2.a	Jul 04, 2013	Jul 11, 2013	Jan 27, 2016	Apr 21, 2016
JHTMON-4 Upper and Lower Campbell Lake Reservoirs Littoral Productivity Assessment	Schedule C.3.b, Schedule E.1.a	Jul 04, 2013	Jul 11, 2013	Jan 27, 2016	May 19, 2016
JHTMON-5 Campbell Reservoirs Littoral vs. Pelagic Fish Production Assessment	Schedule C.3.c, Schedule D.2.b, Schedule E.1.b, Schedule F.5.b	Sep 26, 2013	Nov 12, 2013		
JHTMON-6 Campbell Watershed Riverine Fish Production Assessment	Schedule E.3.a. and 3.b	Sep 26, 2013	Jan 30, 2014		
JHTMON-8 Quinsam and Salmon Rivers Smolt and Spawner Abundance Assessment	Schedule F.5.a	Sep 26, 2013	Jan 30, 2014		
JHTMON-9 Upper and Lower Campbell Lake Reservoir Amphibian Assessment		Mar 31, 2018			
JHTMON-10 Upper and Lower Campbell Lake Reservoirs Shoreline Vegetation Model Validation	Schedule C.4.b, Schedule D.3.b	Sep 26, 2013	Jan 14, 2014	Jun 28, 2016	Jul 26, 2016
JHTMON-11 Upper Campbell Lake Reservoir Erosion Assessment	Schedule C.1.a and 2.a	Jul 04, 2013	Jul 11, 2013		
JHTMON-13 Lower Campbell River Ramping and Tripping Physical Model and Assmt					
JHTMON-14 Lower Campbell River Load Factoring Fisheries Assessment	Schedule E.3.d	To be submitted Jan 31, 2020			
JHTMON-15 Elk Canyon Smolt and Spawner Abundance Assessment	Schedule E.3.e	Sep 26, 2013	Jan 20, 2014	Jan 27, 2016	May 19, 2016
JHTWORKS-1 Upper Campbell Lake Erosion Control					
JHTWORKS-2 Upper and Lower Campbell Lake Recreation Facility Redevelopment		Jan 26, 2016	Mar 15, 2016		
JHTWORKS-3 Upper Campbell Drawdown Zone Revegetation Program		Jun 28, 2016	Jul 26, 2016		
JHTWORKS-4 Sayward Canoe Route (Portage and Signage)		Jan 26, 2016	Mar 15, 2016		
JHTWORKS-5 Salmon River Diversion, Fry Creek Erosion Control		2016-01-20 Early ID Phase funding	Mar 15, 2016		
JHTWORKS-6 Salmon River Diversion Fish Screen Upgrade	Schedule F.4.d	Jan 28, 2014	Apr 10, 2014	Aug 27, 2015	Oct 13, 2015
* JHTMON-13 is negated by the John Hart Upgrade Project					

3 Schedule

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

Table 3-1: Monitoring Programs and Physical Works Schedule as of September 30, 2016.

Physical Works	2013 WLR YR1	2014 WLR YR2	2015 WLR YR3	2016 WLR YR4	2017 WLR YR5	2018 WLR YR6	2019 WLR YR7	2020 WLR YR8	2021 WLR YR9	2022 WLR YR10	2023 WLR YR11	2024 WLR YR12
JHTMON-1 Upper and Lower Campbell Lake Reservoir Digital Elevation Model					■							
JHTMON-2 Upper and Lower Campbell and John Hart Reservoirs Public Use and Perception Survey		✓	✓	✓	■	■	■	■	■	■	■	
JHTMON-3 Upper and Lower Campbell Lake Reservoirs Fish Spawning Success Assessment		✓	✓	✓	■	■	■	■	■	■	■	
JHTMON-4 Upper and Lower Campbell Lake Reservoirs Littoral Productivity Assessment			✓	✓	■							
JHTMON-5 Campbell Reservoirs Littoral vs. Pelagic Fish Production Assessment		✓	✓	✓	■	■	■	■	■	■	■	
JHTMON-6 Campbell Watershed Riverine Fish Production Assessment			✓	✓	■	■	■	■	■	■	■	
JHTMON-7 Campbell River Watershed Riverine Fish Rearing (not ordered)												
JHTMON-8 Quinsam and Salmon Rivers Smolt and Spawner Abundance Assessment		✓	✓	✓	■	■	■	■	■	■	■	
JHTMON-9 Upper and Lower Campbell Lake Reservoir Amphibian Assessment						■	■	■				
JHTMON-10 Upper and Lower Campbell Lake Reservoirs Shoreline Vegetation Model Validation		✓	✓	✓	■	■	■	■	■	■	■	
JHTMON-11 Upper Campbell Lake Reservoir Erosion Assessment				✓	■	■	■	■	■	■	■	
JHTMON-12 Salmon River Diversion Erosion Monitoring (merged with WORKS-5)												
JHTMON-13 Lower Campbell River Ramping and Tripping Physical Model and Assmt [2]												
JHTMON-14 Lower Campbell River Load Factoring Fisheries Assessment								■	■	■	■	■
JHTMON-15 Elk Canyon Smolt and Spawner Abundance Assessment		✓	✓	✓	■	■	■	■	■	■	■	
Physical Works												
JHTWORKS-1 Upper Campbell Lake Erosion Control [1]												
JHTWORKS-2 Upper and Lower Campbell Lake Recreation Facility Redevelopment				✓	■	■	■					
JHTWORKS-3 Upper Campbell Drawdown Zone Revegetation Program				■								
JHTWORKS-4 Sayward Canoe Route (Portage and Signage)				✓	■							
JHTWORKS-5 Salmon River Diversion, Fry Creek Erosion Control [2]												
JHTWORKS-6 Salmon River Diversion Fish Screen Upgrade [2]	✓	✓	✓									

Footnote
[1] Terms of Reference pending results of JHTMON-11. Implementation date and duration of program not set.
[2] Request for relief pending submission. No further work planned.

Legend: ■ = Program to be undertaken/initiated in identified year
✓ = Program completed for the year

4 Monitoring Programs and Physical Works Terms of Reference

The Monitoring Programs and Physical Works being implemented under the Campbell River 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/vancouver_island/campbell_river.html

5 Status of Monitoring Programs

5.1 JHTMON-1 Upper and Lower Campbell Lake Reservoir Digital Elevation Model

We are preparing a Terms of Reference for this project to be submitted to the Comptroller of Water Rights prior to March 17, 2017.

The intent of this project is to review boating hazards related to operating levels on the Upper Campbell Lake Reservoir/Buttle Lake Reservoir, and Campbell Lake Reservoir. On both reservoirs, spatial data will be collected and boating hazard zones will be mapped for different reservoir levels. The scope includes the collation of both existing and new aerial photography, bathymetry, mapping analysis and digital elevation models.

The spatial information collected by this project will also support spatial data needs associated with other projects including JHTWORKS-2 (recreation facility redevelopment), JHTWORKS-3 (revegetation program), as well as JHTMON-3, 4, and 5 (fish spawning and productivity studies).

5.2 JHTMON-2 Upper and Lower Campbell and John Hart Reservoirs Public Use and Perception Survey

The intent of this project is to develop and implement a systematic approach to evaluate public use and perception of the operation and flow management in the Campbell River hydroelectric system, as well as of any works constructed as part of the WUP. The information gathered from this study is expected to provide a better understanding of the relationship between system operations and the overall recreation benefit expected from implementing WUP operations. The information will be used to inform future decisions that would necessitate trade-offs between recreation and other values such as fish and power benefits.

The monitoring program was initiated in 2014 with the design and development of the survey. Field work was conducted in 2015 and 2016 and will be carried out until 2023. Attached is the Year 1 (2014/2015) report dated December 21, 2015.

5.3 JHTMON-3 Upper and Lower Campbell Lake Reservoirs Fish Spawning Success

The intent of this project is to assess the impact of the WUP operating regime on effective spawning habitat for cutthroat trout and rainbow trout in the Upper Campbell Reservoir and Campbell Lake Reservoir.

The study initially used hydro-acoustic surveys as the preferred means to estimate fish populations, supported by data collected through snorkel surveys, as well as surveys of cutthroat redds and assessment of incubation conditions. The first year of study was considered a pilot year to test approaches and methodologies with the intent to “fine-tune” the study in subsequent years.

Upon further review of the methodologies with agencies and the Campbell River Monitoring Committee we determined that changes in study design were necessary immediately in order to remain cost-effective while collecting the best available data to support the study. As a result, with approval of the Comptroller of Water Rights on

August 8, 2014, we reduced the scope of work for testing hydro-acoustic estimation techniques due to uncertainties about the effectiveness of this methodology. Upon completion of the initial pilot year and review of the study methodologies with our contractor and agencies, we decided to replace hydro-acoustic techniques with gill netting and/or trap netting techniques. This change was captured in the most recent Terms of Reference revision and approved by the Comptroller of Water Rights on April 21, 2016.

We continue to review the methods used in this study with agencies and the Monitoring Committee and we will adaptively manage the study to ensure that it will meet the intent while remaining cost effective.

This monitoring program was initiated in June 2014 and will be carried out over 10 years. The Year 2 (2015) report will be included in next year's annual report.

5.4 JHTMON-4 Upper and Lower Campbell Lake Reservoirs Littoral Productivity Assessment

The intent of this study is to assess the extent to which the management of reservoir levels affect littoral productivity. The results of this study will be used with the results of JHTMON-5 to determine how littoral productivity influences fish production.

In a letter dated May 19, 2016, the Comptroller of Water Rights approved a revision to the Terms of Reference for JHTMON-4 increasing the scope of data collection but reducing the duration for data collection. These changes result in a much more robust data set and therefore more likely success in answering the Management Questions. We are expecting to be able to model littoral productivity over a full range of reservoir fluctuations thus reducing the need to collect data over multiple years.

Periphyton, benthic invertebrate, and fish sampling was completed in Lower Campbell Reservoir in Year 1 (2015), with sampling continuing for Upper Campbell Reservoir in Year 2 (2016). Attached is the report for Year 1 (2015) dated July 15, 2016.

5.5 JHTMON-5 Campbell Reservoirs Littoral vs. Pelagic Fish Production Assessment

The intent of this study is to assess the extent to which fish production is driven by littoral or pelagic production and how this relates to BC Hydro operations. The results of this study will be used with the results of JHTMON-3 to determine how littoral or pelagic productivity influences fish production.

This monitoring program was initiated in July 2014 and will be carried out over a 10 year period. The Terms of Reference suggests that there were to be some years where no work was planned; however, for project management efficiencies we have decided to more evenly distribute the work over the full ten year period.

There are two components to this study: the first component uses stable isotope analysis to assess the source of food for fish (littoral or pelagic) as it relates to reservoir operation, and the second component assesses pelagic bacteria as an indicator of biological production related to water residence time in the reservoir. The information gathered from this study will be used to assess linkages between benthic and pelagic production and the effect of BC Hydro operations on fish production.

When this study was initiated, in 2014 we anticipated that there were technical details that may require attention and subsequent revision of the Terms of

Reference. However, upon completion of two years of monitoring field work we identified that the modifications to the study methods were very minor and were within the overall scope, scheduled and budget of the existing Terms of Reference. We notified the Comptroller of Water Rights on June 29, 2016 that despite earlier communications we have determined that a Terms of Reference resubmission is no longer required.

Preliminary analysis shows a strong relationship between lake volume and zooplankton production. This suggests that carbon from non-phytoplankton sources increasingly contributes to zooplankton production as lake surface area declines (larger lakes to smaller lakes), which may further explain some of the variability in fish diets across lakes that have short period of lake water residence time. Therefore, carbon originating from terrestrial sources (e.g., leaf litter) and/or lake macrophytes (aquatic plants growing near shore) seems to be relatively more important in smaller lakes. Based on information collected to date, this suggests that declines in pelagic production due to reduction in water residence times may be buffered in small lakes by large contributions of alternative carbon sources. There are still uncertainties with this conclusion and further data collected for the remainder of the study will support a final conclusion.

Attached is the report for Year 2 (2015) dated October 17, 2016.

5.6 JHTMON-6 Campbell Watershed Riverine Fish Production Assessment

The intent of this study is to address uncertainty around the relationship between habitat and flow in rivers within the Campbell River hydroelectric system and to determine the range of flows migrating fish need to successfully navigate barriers within the rivers. The study also examines the effectiveness of flow versus habitat modelling techniques.

This monitoring program was initiated in April 2015 and will be carried out over nine years. To gain project management efficiencies, the project has been separated into three components:

Component 1: Flow Habitat Relationships,

Component 2: Fish Passage Prescriptions, and

Component 3: Flow Habitat Analysis.

The Component 1 Year 1(2015) report is in draft and will be included in next year's annual report. The Component 2 Year 1 (2015) report is attached. Component 3 will be implemented at a later date.

There are parts of this study pertaining to the Salmon River Diversion that we are reviewing with respect to the recent BC Hydro decision to decommission the Salmon Diversion facility. The review will include input from government agencies and local First Nations and will result in an updated Terms of Reference. We will provide an update on the progress of the review in the next annual report.

5.7 JHTMON-7 Campbell River Watershed Riverine Fish Rearing

This project was not ordered.

The intent of this study was to understand the consequences for fish growth and biomass from small variations in river flow related to operations. Prior to finalizing the Water Use Plan and approval of the Order from the Comptroller of Water Rights,

agencies and BC Hydro agreed that this study did not provide a clear linkage to addressing operational uncertainties identified under the WUP. As a result, the requirement to study riverine fish rearing was not included in the Order.

5.8 JHTMON-8 Quinsam and Salmon Rivers Smolt and Spawner Abundance Assessment

The intent of this study is to identify the primary factors that limit fish abundance in the Campbell River system and how these factors are influenced by BC Hydro operations, as well as to evaluate the effectiveness of WUP-based operations on fish abundance.

This monitoring program was initiated in March 2014 and will be carried out over 10 years. The Year 2 (2015) report will be included in next year's annual report.

There are parts of this study pertaining to the Salmon River Diversion that we are reviewing with respect to the recent BC Hydro decision to decommission the Salmon Diversion facility. The review will include input from government agencies and local First Nation and will result in an updated Terms of Reference. We will provide an update on the progress of the review in the next annual report.

5.9 JHTMON-9 Upper and Lower Campbell Lake Reservoir Amphibian Assessment

The intent of this study is to assess the response of amphibians to the operation of the Campbell River system largely through gaining a better understanding of the linkage between reservoir elevation and flow regime to amphibian habitat quantity and quality.

The initial Terms of Reference submission scheduled for January 31, 2017 will be delayed to March 17, 2018 for project management purposes. This shift in project scheduling will not affect our overall implementation schedule as there are no interdependencies with other work under the WUP and we anticipate that the duration of this study will be no more than three years.

5.10 JHTMON-10 Upper and Lower Campbell Lake Reservoirs Shoreline Vegetation Model Validation

The intent of this study is to determine if the shoreline vegetation model used during the development of the WUP to quantify operational impacts of reservoir operations could accurately predict how the plant communities respond to reservoir operational change over time.

This monitoring program was initiated in July 2014. Year 1 of this program served to re-establish the vegetation community baseline data for the Upper Campbell Lake Reservoir, collect new vegetation community data for the Lower Campbell Lake Reservoir and Brewster Lake, install a hydrology gauge on Brewster Lake, monitor water levels in Upper Campbell Lake Reservoir, Lower Campbell Lake Reservoir and Brewster Lake, and map the areal extent of the key riparian vegetation communities through air photo interpretation of current photogrammetry. This information has been reviewed in comparison to predictions from the shoreline vegetation model.

The Year 1 results demonstrated that for the Upper Campbell Reservoir, the shoreline vegetation model did not correlate well with field observations. We have decided that fieldwork originally planned for Year 10 would be better done in Year 5. This will allow calibration of the model and confirmation of its ability to predict

vegetation community change before the end of the study period. If at Year 5, the model is proven to be accurate or it can be improved to more accurately predict vegetation community change associated with reservoir operations, Years 6 to 10 data collection may not be necessary. However, currently we are forecasting to continue water level data collection and reporting through Year 10.

We prepared a Terms of Reference revision based on the Year 1 field observations, subsequent technical meetings through 2015/2016 with our contract team and subject matter expert, and discussion with the Monitoring Committee on June 20, 2016. We received approval to proceed with the changes in the study program from the Comptroller of Water rights on July 26, 2016.

The Year 1 (2014/2015) report will be included in next year's annual report.

5.11 JHTMON-11 Upper Campbell Lake Reservoir Erosion Assessment

The original approved Terms of Reference assumed that enough information was known to conclude that private properties (i.e., Cedar Creek, Strathcona Park and Strathcona Park Lodge subdivisions) were being affected by shoreline impacts related to reservoir operations. However, upon further review, we have determined that a better understanding of shoreline impact and erosion processes relative to private property boundaries is necessary in order to determine the best approach to address issues associated with shoreline impacts.

The original TOR included collecting data on wind and wave action adjacent to private properties which we initiated in 2016. A wind and wave monitoring buoy was deployed in Upper Campbell Lake on August 31, 2016 and is collecting hourly data and will continue for up to three years.

In order to more effectively focus this study on assessing the risk of shoreline impacts to private properties, we will be revising the Terms of Reference to include a geotechnical survey that will more accurately define the potential for shoreline impact relative to BC Hydro property and private property boundaries. We plan to submit this Terms of Reference revision to the Comptroller of Water Rights by June 23, 2017.

5.12 JHTMON-12 Salmon River Diversion Erosion Monitoring

The intent of JHTMON-12 was to develop a correlation between Salmon River Diversion flows and the rate of erosion and identified locations. However, for project management efficiency the Consultative Committee agreed to merge this study with JHTWORKS-5 Salmon River Diversion, Fry Creek Erosion Control.

Due to BC Hydro's recent decision to decommission the Salmon River Diversion facility, BC Hydro will be seeking relief from JHTWORKS-5.

5.13 JHTMON-13 Lower Campbell River Ramping and Tripping Physical Model and Assessment

This study was intended to correlate the quantity and quality of spawning and rearing habitat with John Hart Generating Station ramp rates and tripping events.

Due to the John Hart Generating Station upgrade project and the application of a flow bypass system in the new facility designed to automatically bypass flows during tripping events, this project will no longer be necessary. BC Hydro will be seeking relief from this project by August 18, 2017.

5.14 JHTMON-14 Lower Campbell River Load Factoring Fisheries Assessment

The intent of this project is to develop a correlation between load factoring (ramping according to peak power demand) at John Hart Generating Station and spawning/rearing behaviour and success. This two-year project will start after the John Hart Generating Station replacement project is completed and load factoring operations for the new facility are proposed.

5.15 JHTMON-15 Elk Canyon Smolt and Spawner Abundance Assessment

The intent of this study is to track the success or failure of the flow prescription in the Elk Canyon in meeting the intended WUP objectives around optimizing the flow versus habitat relationship in the canyon. The critical areas covered in this study are: the assessment of the base flow and its effect on juvenile rearing habitat; the prescribed pulse flows and their ability to attract upstream migration of spawners; the effectiveness of increased flow on spawning habitat; and the effect of resuming base flows on redds and egg incubation. In general the study also looks at whether the general fish productivity in the Elk Canyon has increased as expected under the WUP operation.

This monitoring program was initiated in September 2014 and will be carried out over 10 years.

On May 19, 2016, we received approval from the Comptroller of Water Rights for a revision of the Terms of Reference to make changes to the scope and schedule for this project. The changes include extension of the spring smolt sampling period by on month and adjustments to the sampling frequency for the rotary screw trap; inclusion of nighttime snorkel surveys to target juveniles that might be inactive during the daytime; and addition of an instream flow study that provides multiple lines of evidence to assess the effects of prescribed flow releases.

The 2015 report is in draft and will be included in next year's annual report.

6 Status of Physical Works

6.1 JHTWORKS-1 Upper Campbell Lake Erosion Control

This physical works project was intended to develop an engineered solution using "soft techniques" (e.g., vegetation and natural materials) to mitigate shoreline erosion adjacent to private properties at Cedar Creek, Strathcona Park and Strathcona Park Lodge subdivisions. As stated above under JHTMON-11, wind and wave data is now being collected, and property/geotechnical surveys are planned in order to support a decision on the need for an erosion control physical works strategy.

If a decision is made to proceed with a physical works strategy, a Terms of Reference will be prepared and submitted to the Comptroller of Water Rights. Status of this project will be updated in the subsequent annual report.

6.2 JHTWORKS-2 Upper and Lower Campbell Lake Recreation Facility Redevelopment

This physical works project is intended to determine the feasibility of upgrading boat ramps and beaches in Provincial Park sites and forest recreation sites in the Upper Campbell Lake and Buttle Lake Reservoir and Campbell Lake Reservoir, to define and prioritize upgrades as ordered by the Comptroller of Water Rights and to assess

boating related recreation hazards. The focus of the work is to improve recreational access and address public safety risk across the normal operational range of both reservoirs.

The Terms of Reference for the identification/feasibility and early definition phases of this project was approved by the Comptroller of Water Rights on March 15, 2016. The Terms of Reference was developed with input on site selection and scope from local BC Parks and FLNRO staff. Two engineering firms were selected in September 2016 to identify design options for the project with one firm is focusing on boat ramp improvements and recreational hazard mitigation and the second firm focusing on recreational access and beach enhancements.

By the next annual report we will have an update on the design options and recommendations for construction. These will be outlined in a Terms of Reference resubmission for the detailed design and implementation of the work.

6.3 JHTWORKS-3 Upper Campbell Drawdown Zone Revegetation Program

The intent of this project is to identify, prioritize and revegetate highly visible reservoir perimeter sites within the drawdown zone in the Upper Campbell Reservoir.

Our approach to this project was discussed with the Monitoring Committee on April 20, 2016. The project will be delivered in three phases with Phases 1 and 2 included in this Terms of Reference while the methods and the budget for Phase 3 will be submitted to the Comptroller for approval at the end of Year 6. The first phase of the project will include identification and prioritization of highly visible reservoir perimeter sites for treatment, within the drawdown zone that have the highest potential for natural recolonization success. Phase 2 will include trial treatments at selected high priority sites and the development of a Re-vegetation Treatment Plan to be implemented in Phase 3.

The TOR for this project was approved on July 26, 2016 by the Comptroller of Water Rights. We have selected a contract team to implement the first phase of work later this year.

6.4 JHTWORKS-4 Sayward Canoe Route (Portage and Signage)

The original intent of this project was to improve access and signage along portage routes on the Salmon River Diversion to reduce public safety risks. Since the Consultative Committee process wrapped up in March 2003, Recreation Sites and Trails BC (FLNRO) has upgraded the portage trail along the Salmon River Diversion portion of the Sayward Canoe Route. As a result, improving access along the portage routes is no longer required and the Terms for Reference of this project focuses on the enhancement of signage and safety advisories associated with approximately 6 km of the Sayward Canoe Route along the Salmon River Diversion.

The TOR for this project was approved by the Comptroller of Water Rights on May 15, 2016. The signs have been developed with input and acceptance from local stakeholders and agencies. A contractor was selected to install the signs at key points along the canoe route prior to the spring of 2017 before the next canoe recreation season.

6.5 JHTWORKS-5 Salmon River Diversion, Fry Creek Erosion Control

Due to BC Hydro's recent decision to decommission the Salmon River Diversion facility, BC Hydro will be seeking relief from this project.

6.6 JHTWORKS-6 Salmon River Diversion Fish Screen Upgrade

Due to BC Hydro's recent decision to decommission the Salmon River Diversion facility, BC Hydro will be seeking relief from this project.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Campbell River WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to September 30, 2016.

Table 7-1: Campbell 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
Campbell River WUP Annual Report	$21,194	$3,166	$16,167	$19,334	$1,860		
JHTM02A Public Use Perception	$1,345,982	$211,886	$978,122	$1,190,008	$155,974	TOR approved budget includes contingency	
JHTM02A Public Use Perception - OR DM	$117,321	$27,625	$48,214	$75,839	$41,482		
JHTM02A Public Use Perception - OR Imp	$1,228,661	$184,262	$929,907	$1,114,169	$114,492		
JHTM03A Fish Spawn Success As	$1,657,581	$459,771	$1,188,119	$1,647,890	$9,691		
JHTM03A Fish Spawn Success As - OR DM	$149,098	$48,903	$65,835	$114,738	$34,360		
JHTM03A Fish Spawn Success As - OR Imp	$1,508,483	$410,868	$1,097,614	$1,508,482	$1		
JHTM04A Littoral Productivity	$632,771	$332,169	$218,409	$550,578	$82,193	efficiencies found during project implementation	
JHTM04A Littoral Productivity - OR DM	$104,696	$30,248	$24,053	$54,302	$50,394		
JHTM04A Littoral Productivity - OR Imp	$528,075	$301,921	$194,355	$496,277	$31,798		
JHTM05A Littoral vs Pelagic	$985,111	$407,341	$536,898	$944,239	$40,872	efficiencies found during project implementation	
JHTM05A Littoral vs Pelagic - OR DM	$116,246	$28,537	$33,532	$62,070	$54,176		
JHTM05A Littoral vs Pelagic - OR Imp	$868,865	$378,804	$490,060	$868,864	$1		
JHTM06A Fish Production Asses	$839,068	$181,154	$652,993	$834,147	$4,921		
JHTM06A Fish Production Asses - OR DM	$110,518	$30,896	$52,151	$83,047	$27,471		
JHTM06A Fish Production Asses - OR Imp	$728,550	$150,258	$578,291	$728,549	$1		
JHTM07A Fish Rearing Behavior			$0	$0	($0)	project was not ordered	
JHTM07A Fish Rearing Behavior - OR DM			$0	$0	($0)		
JHTM07A Fish Rearing Behavior - OR Imp			$0	$0	($0)		
JHTM08A Quinsam & Salmon	$2,246,345	$598,105	$1,614,044	$2,212,149	$34,196		
JHTM08A Quinsam & Salmon - OR DM	$137,667	$37,578	$65,893	$103,471	$34,196		
JHTM08A Quinsam & Salmon - OR Imp	$2,108,678	$560,527	$1,548,151	$2,108,678			
JHTM09A Lake Res Amphibian As		$6,341	$126,322	$132,663	($132,663)	no TOR	TOR submission planned for March 17, 2018
JHTM09A Lake Res Amphibian As - OR DM		$5,837	$41,766	$47,603	($47,603)		
JHTM09A Lake Res Amphibian As - OR Imp		$505	$84,555	$85,060	($85,060)		
JHTM10A Shoreline Veg Model	$268,799	$173,081	$95,718	$268,799	$0		
JHTM10A Shoreline Veg Model - OR DM	$65,412	$47,348	$18,064	$65,412			
JHTM10A Shoreline Veg Model - OR Imp	$203,387	$125,733	$77,654	$203,387			
JHTM11A Erosion Assessment	$344,874	$49,472	$272,254	$321,726	$23,148		
JHTM11A Erosion Assessment - OR DM	$76,403	$37,439	$67,712	$105,151	($28,748)		
JHTM11A Erosion Assessment - OR Imp	$268,471	$12,033	$204,542	$216,575	$51,896		
JHTM12A Salmon Div Erosion			$0	$0	($0)	study merged with WORKS-5	
JHTM12A Salmon Div Erosion - OR DM			$0	$0	($0)		
JHTM12A Salmon Div Erosion - OR Imp			$0	$0	($0)		
JHTM13A Ramp / Trip Physical		$6,881	$1,300	$8,181	($8,181)	requesting relief, final reporting outstanding	Letter requesting relief planned for August 18, 2017
JHTM13A Ramp / Trip Physical - OR DM		$6,881	$1,300	$8,181	($8,181)		
JHTM13A Ramp / Trip Physical - OR Imp			$0	$0	($0)		
JHTM14A Factoring Fisheries		$8,623	$684,200	$692,823	($692,823)	no TOR, project not yet implemented	TOR submission
JHTM14A Factoring Fisheries - OR DM		$8,623	$32,396	$41,019	($41,019)		
JHTM14A Factoring Fisheries - OR Imp			$651,804	$651,804	($651,804)		
JHTM15A Elk Canyon Smolt	$2,180,378	$635,480	$1,364,479	$1,999,959	$180,419	TOR approved budget includes contingency	
JHTM15A Elk Canyon Smolt - OR DM	$141,441	$55,821	$69,776	$125,597	$15,845		
JHTM15A Elk Canyon Smolt - OR Imp	$2,038,937	$579,659	$1,294,703	$1,874,362	$164,575		
JHTW01A Up Campbell Erosion		$18,364	$0	$18,364	($18,364)	no TOR, future phases not yet forecast	TOR submission after the identification and feasibility phases are complete
JHTW01A Up Campbell Erosion - OR DM		$18,364	$0	$18,364	($18,364)		
JHTW01A Up Campbell Erosion - OR Imp			$0	$0	($0)		
JHTW02A Rec Facility Upgrade	$182,385	$47,580	$1,199,363	$1,246,943	($1,064,558)	The reported overspend is related to our current estimate for total project forecast including future phases of work that have not been approved.	TOR submission after the identification and feasibility phases are complete
JHTW02A Rec Facility Upgrade - OR DM	$63,257	$47,580	$89,363	$136,943	($73,686)		
JHTW02A Rec Facility Upgrade - OR Imp	$119,128		$1,110,000	$1,110,000	($990,872)		
JHTW03A Up Campbell Re-Vega	$774,380	$53,835	$720,545	$774,380	$0		
JHTW03A Up Campbell Re-Vege - OR DM	$92,833	$53,835	$38,998	$92,833			
JHTW03A Up Campbell Re-Vege - OR Imp	$681,547		$681,547	$681,547			
JHTW04A Sayward Canoe Route	$45,788	$11,565	$29,295	$40,860	$4,928		
JHTW04A Sayward Canoe Route - OR DM	$20,488	$10,504	$5,057	$15,560	$4,928		
JHTW04A Sayward Canoe Route - OR Imp	$25,300	$1,062	$24,238	$25,300	$0		
JHTW05A Salmon Erosion Cont	$54,462	$17,106	$1,300	$18,406	$36,057	requesting relief, final reporting outstanding	Seek relief from the CWR to dismiss this project due to the decommissioning of the Salmon River Diversion Dam
JHTW05A Salmon Erosion Cont - OR DM	$54,462	$17,106	$1,300	$18,406	$36,057		
JHTW05A Salmon Erosion Cont - OR Imp							
JHTW06A Salmon Screen Upgrade	$842,742	$480,597	$1,300	$481,897	$360,845	requesting relief, final reporting outstanding	Seek relief from the CWR to dismiss this project due to the decommissioning of the Salmon River Diversion Dam
JHTW06A Salmon Screen Upgrade - OR DM	$46,881	$41,526	$1,300	$42,826	$4,055		
JHTW06A Salmon Screen Upgrade - OR Imp	$795,861	$439,071		$439,071	$356,790		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

*** Red values in parentheses denote overage.**