Columbia Projects Water Use Plan

Physical Works Terms of Reference

CLBWORKS-30A Arrow Lakes Reservoir Wildlife Enhancement Program (Mid-Columbia River) – Maintenance Phase

Addendum 3
March 25, 2021

A1.0 Addendum to CLBWORKS-30A

A1.1 Background

This Terms of Reference (TOR) is submitted pursuant to the Columbia Projects Water Use Plan (WUP) Order dated January 26, 2007, under the schedule for Conditional Columbia Works and Effective Monitoring Studies, Clause 4(a).

The purpose of this works project is as follows:

- To protect and enhance areas of high value wildlife habitat identified within the Revelstoke Reach Area (WUP Order, Schedule C, Clause 5(h)); and
- To improve conditions for nesting and migratory birds and wildlife within Revelstoke Reach as identified in feasibility studies (WUP Order, Schedule C Clause 6(a)).

Between 2012 and 2016, two sites were selected for implementation of physical works at Airport Marsh (site 6A), and at Cartier Bay (site 15A).

- Erosion protection was installed at site 6A to protect the wetland at Airport Marsh in October 2013.
- A reinforcement of the existing berm at Cartier Bay (site 15A) was completed in October 2016.

A1.2 Rationale for Addendum

The purpose of this TOR Addendum 3 is to define the scope for maintenance of the physical work sites.

This submission includes scope for:

- periodic inspections;
- minor regular maintenance (i.e., minor fills); and
- significant major repairs and alterations necessary to continue to protect the wetland values.

The duration of this Addendum is for a six-year period to the last field season in 2026 (which is last year of the 20-year remissions for the Columbia WUP), or until the WUP Order Review (WUPOR) is complete, whichever comes first.

This scope and duration are necessary for two primary reasons:

1) To gather information on the durability of the project designs over time to inform the WUP Order Review, including what type of long-term maintenance program is appropriate for these projects in the region; and
2) To ensure the wetlands are functioning as intended and are in compliance with the regulatory obligations (e.g., provincial Dam Safety regulation).

A2.3 Linkages to other Columbia Project WUP Projects

This project has linkages with other Columbia WUP projects as shown in the table below.

Table 1: Related WUP projects

Project	Objective of Project	Relationship to CLBWORKS-30A
CLBWORKS-29A: Arrow Lakes Feasibility Study of Wildlife Physical Works	Identification and feasibility of candidate sites for physical works enhancement	Prior steps that identified and evaluated sites 6A and 15A as sites of high value
CLBMON-11B4: Monitoring Wetland and Riparian Habitat in Revelstoke Reach in Response to Wildlife Physical Works	Monitor the wildlife utilization patterns in response to revegetation of physical work sites in Revelstoke Reach	Annual before and after biological monitoring of any impact of the Physical Works;

The biological monitoring under CLBMON-11B4 completed its last year of monitoring in 2020. Should there be major repairs undertaken at either of the sites, BC Hydro will determine whether additional biological monitoring is required and will make submissions related to CLBMON-11B accordingly.

A2.0 Maintenance Proposal

A2.1 Approach to maintenance

The approach to structural inspections and maintenance is summarized as follows:

1. Conduct periodic inspections of the sites;
2. Undertake minor, periodic maintenance if deemed necessary;
3. Evaluate major structural repairs on a case-by-case basis; and
4. Summarize the findings in a final engineering memo to support WUP Order Review discussions.

The next sections provide additional information on these steps.

A2.1.1 Conduct periodic inspections of the sites

The sites should be inspected periodically to confirm that the structures are performing as intended. There are two types of inspections planned:

- Periodic visual site inspections: These will be completed for 6A, with photos taken, and if necessary, any change in condition will be documented.
- Engineering inspections: To ensure compliance with Dam Safety and water licence (Licence No. C132684) [1]requirements at site 15A, annual inspections will occur. These inspections include survey at key points and document the current state. The

[1] The Conditional Water licence specifics the maximum amount of water which may be stored for conservation purposes is 243,000 cubic metres. It does not specify a minimum or maximum elevation. The also specifies modification or maintenance requires an Environmental Management Plan, which must be to the satisfaction of an Engineer of the *Water Sustainability Act.*

findings will be summarized in the final engineering memo described in Section A2.1.4 below).

- Water elevation monitoring: Level loggers will be installed within Cartier Bay to understand the impact of any modifications on water elevation and ensure compliance with the water licence.

A2.1.2 Undertake minor, periodic maintenance if deemed necessary

Following inspection, it may be necessary to undertake periodic maintenance particularly in cases where the overall objectives of the project could be compromised. For example, small amounts of rip-rap or gravel may be replaced at outflows, if there is concern about the rate of erosion.

This type of maintenance will occur opportunistically. It may require consultation with biologists and/or engineers to determine whether the issue would be compromising the wetland. Records will be kept of all maintenance undertaken and included in the final report.

A2.1.3 Evaluate major structural repairs on a case-by-case basis

At this time, BC Hydro is also requesting a provision for major structural repairs for the Cartier Bay site (site 15A) following emergency work that was undertaken in fall 2020.

The key steps for undertaking a major structural repair are the same as the implementation steps described in the CLBWORKS-30A TOR Addendum 2, dated September 2015 (see section 3.1 Key-Tasks Implementation) and will be scaled down appropriately for the size of the structural repair. That is, we will seek an engineered solution, appropriate regulatory approvals and permits and ensure appropriate environmental and archeological planning prior to and during construction of the repairs.

A2.1.4 Summarize the findings in an engineering memo

Following the final inspections, and incorporating information from any maintenance undertaken, a final engineering condition assessment project report will be prepared. The final report may include (but is not limited to) the following:

- Survey data
- Summary of the changes and findings over the period and since construction;
- Overall condition assessment of the works;
- Photos supporting the assessment;
- Lessons learned, if appropriate; and
- If relevant, include design recommendations as appropriate that could inform any future similar physical works.

A2.2 Schedule

A schedule for illustration purposes is shown in Table 2 below. The minor repairs include place holders should repairs be necessary at the site 6A location.

Table 2: Proposed Monitoring and Repairs Schedule

Task	2021	2022	2023	2024	2025	2026
Inspections	x	x	x	x	x	x
Minor repairs (e.g., rip rap)		x	x			
Known Major Repairs (Site 15A)						
Design, specifications, drawings and reporting	x					
Construction (Supply/Install)	Winter 2021/22					
Summary memo					x Earliest of WUPOR or 2026	

A2.3 Budget

The implementation budget for this TOR Addendum 3 is shown in Table 3 below. It requires additional implementation budget of $176,414, for a revised total implementation budget for CLBWORKS-30A of $1,252,183.

The budget assumptions are provided below:

- Inflation: 2% per annum.
- $5,000/year in alternate years has been added for minor repairs which is based on the cost to undertake the emergency repairs in fall 2020. It is possible that Site 6A may require minor repairs in the coming year and includes a provision should smaller fixes be required at Site 15A in the future.
- Additionally, the budget includes $50k to allow for any emergency repairs that are time-sensitive due to reservoir levels (shown in Table 3 in 2023; however, it could occur at any time within the period leading up to WUPOR). This will also allow for early investigations should another issue arise at site 6A. Updates to the Annual Report would be provided for any work of this nature.
- As we are awaiting additional site visits to confirm an engineering approach for the Site 15 A major repair, we have applied a 30% contingency to our estimate for 2021 and for 2023.

Table 3: Budget associated with TOR Addendum 3

The total revised budget for the project is $176,414