

Columbia River Water Use Plan

Physical Works Terms of Reference

- **CLBWORKS-30 Arrow Lakes Reservoir Wildlife Enhancement Program**

June 6, 2012

1.0 Introduction

This Terms of Reference (ToR) outlines the rationale and costs associated with the construction of Phase 1 of the wildlife physical works in lieu of operational changes to Arrow Lakes Reservoir operations as ordered under the Columbia River Water Use Plan (WUP) Implementation Order (26 January 2007).

1.1 Background

During the WUP, the Consultative Committee (CC) supported the implementation of wildlife physical works in the mid Columbia River in lieu of changes to reservoir operations to help mitigate the impacts of Arrow Lakes Reservoir operations on wildlife and wildlife habitat. As there was some uncertainty related to the feasibility of the proposed projects, it was recommended that an adaptive approach be taken to provide flexibility and opportunity for ongoing discussions in the formulation and implementation of the wildlife physical works. It was acknowledged that feasibility/risk assessments, detailed planning studies, and First Nations, agency, stakeholder and public input would be required to address the target wildlife species/communities, engineering design, and potential impacts on other interests.

In 2008, BC Hydro undertook a feasibility assessment to review 44 sites identified in the Columbia Water Use Plan. Sites were assessed in the context of risks and feasibility, and public consultation and First Nations input were sought. BC Hydro established a Wildlife Physical Works Committee (WPWC) with representation from BC Hydro, Ministry of Environment, Ducks Unlimited, First Nations, and local stakeholders. An initial feasibility assessment of the projects was conducted and nine projects were deemed not feasible as they were either prohibitively expensive or there was a high likelihood that the specified objectives could not be met. The remaining 35 projects were assessed based on biological and operational criteria. Biological criteria included seasonal availability, habitat type, target species groups, species at risk, and regional wildlife priorities. Operational criteria included cost, access, and hydrology. Fire interface concerns were also incorporated into the assessment at the request of the Columbia Shuswap Regional District. Three guiding principles were applied during the selection of candidate projects: 1) the potential for learning opportunities, 2) the proximity of candidate sites to one another, and 3) a desire to implement a range of treatment types. Based on the directions received from the WPWC and the guiding principles, eight projects were identified for further consideration. A public open house was held in Revelstoke presenting the findings.

In 2009, detailed sites plans were developed for five of the eight projects. The design plans included an environmental assessment, material and construction specifications, engineering drawings, cost estimates, and a preliminary archaeological risk assessment. After a review of project costs and anticipated benefits, the WPWC endorsed three of the five projects, as two

projects were rejected based on low anticipated benefits in relation to cost. A brief description of the projects follows below; further information is available in Golder (2009) and Hawkes et al. (2011).

1.2 Study sites

Site locations are shown in Figure CLBWORKS -1. The northernmost project, **Site 6A** (Airport Slough outflow), is located approximately one km south of the confluence of the Illecillewaet and Columbia rivers, 900 m northwest of the Revelstoke Airport and directly north of Machete Island. The physical works project at Site 6A would address an eroding outflow channel located near Airport Marsh and Machete Island. Both Airport Marsh and Machete Island provide important habitat for migratory songbirds, migratory and resident water birds (e.g., both shore birds and diving and dabbling ducks), and Western Painted Turtles. The design proposes a simple riprap mattress to halt the erosion of the east arm of the channel. Although this project does not propose to create or enhance habitat for wildlife, it will help maintain the existing high value habitat of Machete Island and Airport Marsh.

The primary objective of the two Cartier Bay projects is to increase the amount of shallow water habitat to benefit reptiles, amphibians and waterfowl. **Site 14** in Cartier Bay (Cartier Area Dyke) is located eight (8) km south of Revelstoke. It involves the construction of a small dyke within the gap of the existing rail grade. The project should result in ponding water upstream of the grade while still accommodating fish passage. It will also provide seasonal staging habitat for migratory waterfowl and breeding habitat for amphibians.

Works at **Site 15A** (also located in Cartier Bay) involves the removal of an old collapsed wooden box culvert and dike reconstruction. The dyke will be reconstructed at an elevation approximately one (1) meter higher than presently and will increase water level of the existing wetland compartment. The additional 1 m of elevation will significantly increase the amount of shallow open water habitat (depths less than <1 m) from 26 ha to 53 ha. Elevating the dyke will also decrease the period of inundation and frequency of inundation by the reservoir, thereby increasing the overall productivity of the wetland.



Figure CLBWORKS -1. Approximate location of proposed enhancement sites. Scale is 1:50000. Figure from Golder 2009.

1.3 Management Questions

The Arrow Lakes Reservoir Wildlife Enhancement program does not answer any WUP management question. Rather it will provide enhanced habitat for wildlife, primarily in the form of increased wetland habitat.

1.4 Key Water Use Decision Affected

The program will provide information required to support future decisions around maintaining the existing operating regime or modifying operations. The effectiveness of the Arrow Lakes Reservoir Wildlife Enhancement program will be assessed by a monitoring program under CLBMON 11B; baseline data collection has already been initiated under that program.

2.0 MONITORING PROGRAM PROPOSAL

2.1 Objectives and Scope

The primary objective of the program is to enhance and protect high value wildlife habitats along the drawdown zone of the middle reach of the Arrow Lakes Reservoir. The geographic scope of the program is the eastern side of the middle reach of the Arrow Lakes Reservoir south of the town of Revelstoke. All three projects are located within the inundation zone of the Arrow Lakes Reservoir, ranging between approximately 30 – 500 m east of the main channel of the Columbia River, and at elevations of between 433 masl and 437.8 masl.

2.2 Approach

All proposed physical works will create wetland habitat with water levels that are more permanent and stable than those currently provided at the sites. This will be achieved by constructing or enhancing physical structures (dykes, riprap mattress) that will either retain water and or keep the reservoir water levels from flooding the area as frequently as presently. Local materials will be used whenever possible.

2.3 Tasks

2.3.1 Task 1: Project Management

Project management will involve the general administrative and technical oversight of the project. This task will include, but not be limited to: 1) budget management; 2) study team management; 3) logistic coordination; 4) technical oversight of field work; and 5) data transfer among related investigations.

An Environment Management Plan and a Safety plan must be developed for all aspects of the study involving field work in accordance with BC Hydro procedures and guidelines. Specific safety training may be required.

2.3.2 Task 2: Project Planning

Project planning can be subdivided into five subtasks (Table CLBWORKS-30-1). Refer to Golder (2009) and to Hawkes and Howard (2011) for details of each task.

Table CLBWORKS-30 -1. Project planning tasks. Table modified from Hawkes and Howard (2011) and Golder (2009).

Subtask	Subtask Elements
Project Approval	<ul style="list-style-type: none"> • Construction Plan • Site Access • Permits and Regulation¹ • Archaeology² • Schedules and Site Drawings • Construction Contract
Construction Tendering	<ul style="list-style-type: none"> • Archaeology Impact Assessment • Contract Award • Final construction schematics
Construction	<ul style="list-style-type: none"> • Environmental monitoring • Archaeological monitoring (if necessary) • Mobilization • Excavation & debris removal • Construction • Sediment control • Armouring
Construction completion	<ul style="list-style-type: none"> • Revegetation • Demobilization • Final engineer inspection • Post construction clean up • As-built drawings
Post construction monitoring	

1 – permits required may include approval under Sections 9 and 7 of the Water Act, notifications to DFO, and Heritage Inspection permits. Scientific fish collection permits may also be required in the event of fish salvage.

2 – None of the ALR archaeological sites are located within sites 14 and 15A and no impacts are expected from proposed development in these two sites (Golder 2009)

2.3.3 Task 3: Project Construction

A brief overview of construction activities is provided below, taken from Golder (2009). Details of construction activities and locations of source materials can be found in Golder (2009).

Site 6A (Airport Slough). Loose sloughed-in materials should be carefully removed on the banks and bottom of the east arm and channel walls. This is intended to change the contour from almost vertical to a flat U-shape. The cleaned out contoured east channel will be filled with small riprap. A shallow swale will be constructed along the length of the infill to channel surface run-off onto a sloped toe at the confluence with the main erosion channel.

Site 14 (Cartier Bay). The existing breach in the abandoned railway grade should be contoured and built up to provide a swale in the grade. Stream flows will likely need to be stopped prior to construction with a temporary cofferdam to divert water around the project area to dry out the proposed footprint.

Site 15a (Cartier Bay). The existing breach in the abandoned railway grade should be contoured and built up to provide a dike with a swale. As in Site 14, flows will likely need to be stopped prior to construction with a temporary cofferdam to divert water around the project area to dry out the proposed footprint. The upstream and downstream slopes of the existing abandoned railway grade may need be contoured, built up and armoured with riprap over a length beyond the engineered swale, both on the upstream and downstream faces of the existing embankment.

2.4 Schedule

As per the TOR for CLBWORKS 29A, the proposed timeline for construction was between 2010 and 2018. Construction should be carried out between late March and mid June (during low reservoir levels). The start of the work will depend on the snow presence and drawdown dryness.

Construction of Site 6A is expected to take one week, whereas the dykes proposed for Sites 14 and 15A will likely take between two to three weeks to complete.

2.5 Budget

Based on the preliminary cost estimate developed by BC Hydro's Project Delivery team, the expected cost of undertaking these wildlife physical works projects in Arrow Lakes Reservoir is \$1,057,000 (+50%/-15%). This cost estimate represents the variance applicable to a Feasibility Level phase in the project life cycle. The cost estimate will be more narrowly defined as the project progresses. The total cost for the implementation of the proposed projects is within the costs estimated in the Columbia Water Use Plan, which was \$2,500,000 over 10 years or \$250,000 per year.

References

- Golder. 2009. CLBWORKS-29A Phase II. Arrow Lakes Reservoir wildlife physical works feasibility study phase II. Unpublished report by Golder Associates, Kamloops, for BC Hydro, Castlegar, BC.
- Hawkes, V.C., M.T. Miller, J.D. Fenneman and N. Winchester. 2011. CLBMON-11B4 Monitoring Wetland and Riparian Habitat in Revelstoke Reach in Response to Wildlife Physical Habitat Works. Annual Report – 2010. Report EA3232 to BC Hydro, Burnaby, BC.
- Hawkes, V.C. and J. Howard. 2012. CLBMON-11B. Wildlife effectiveness monitoring and enhancement area identification for lower and mid-Arrow Lakes Reservoir: CLBWORKS-29B. Mid- and lower Arrow Lakes Reservoir wildlife enhancement prescriptions. LGL Report EA3274 for B.C. Hydro Generation, Water License Requirements, Burnaby, BC.