Campbell River Water Use Plan

Physical Works Terms of Reference

- **JHTWORKS-6 Salmon River Diversion Juvenile Fish Screen Upgrade**

Addendum 1

August 4, 2015

A1 Addendum to JHTWORKS-6 Salmon River Diversion Juvenile Fish Screen Upgrade

A1.1 Addendum Rationale

This Terms of Reference (TOR) addendum identifies the scope of work and budget to complete the Definition Phase (preliminary design) for the Salmon River Diversion Juvenile Fish Screen Upgrade.

A2 Physical Works Program Definition Phase (Preliminary Design) Proposal

A2.1 Project Objectives

The project objectives remain largely the same as the original approved Terms of Reference with the exception that canal flow objectives have been reduced to 15 m^3/s from 30 m^3/s. This change is based on an economic analysis done in the Identification Phase (feasibility design) that indicated minimal economic advantage over the 20-year service life of the canal to increase capacity beyond 15 m^3/s.

The two main project objectives are now stated as follows:

- Obtain agreement from agencies and affected stakeholders on the criteria to be used to determine “acceptable operation” (screening rates of fish, condition of screened fish, operational safety, compliance monitoring requirements) for operation of the Salmon River Fish Screen at canal flows up to 15 m^3/s.
- Identify, design and implement a Salmon River Fish Screen solution integrated with the Salmon River Diversion Upgrade Project to achieve “acceptable operation” of the screen at canal flows up to 15 m^3/s.

The project team will continue to work with agencies and First Nations on the design criteria during the Definition Phase (detailed design) of the project.

A2.2 Selected Alternative

Three replacement fish screen options were evaluated in the feasibility design. These included:

- Single Vee Screen
- Double Vee Screen
- Vertical Angle Screen

A fourth alternative, consisting of modification to the existing screen structure to improve fish passage efficiency was also considered; however, due to the following limitations, this option was dismissed:

- The existing fish screen was designed for screening smolts during the spring period; however, the requirements under the current Campbell River Order from the Comptroller of Water Rights specifies the operation of the fish screen from April 1 to December 31. Debris and ice in the later months pose operational challenges.

- Modifying the existing fish screen provides limited and uncertain improvement to screening efficiency.

The selected alternative is a Vertical Angle Screen and fish bypass to be located in the diversion canal.

The Vertical Angle Screen option was chosen based on the recommendations from a Structured Decision Making (SDM) process involving BC Hydro, Office of the Comptroller of Water Rights, We Wai Kai First Nation, Wei Wai Kum First Nation, K'omoks First Nation, Fisheries and Oceans Canada (DFO), and Ministry of Forests, Lands, and Natural Resource Operations (FLNRO). The SDM session focussed on evaluation of the three alternatives noted above. Each alternative was evaluated across forty-five criteria for objectives that included fish passage biological efficiency, constructability challenges, environmental impact (during and post-construction), operational impact, screen cleaning efficiency, design approach, cost, and safety risk. The performance of each alternative across these objectives was compared using an evaluation matrix, and trade-offs were deliberated by participants in the SDM session.

The Vertical Angle Screen option performed better than the all other options for the technical criteria including operational impact, screen cleaning efficiency, design approach, and cost. The Single Vee Screen outperformed the Double Vee Screen across most objectives. As a result the Double Vee Screen option was removed from further consideration from the evaluation early in the session. The Single Vee Screen option showed better biological performance overall; however, the differences in expected biological efficiency compared to the Vertical Angle Screen were discussed in the SDM session and the participants concluded that the difference in biological efficiency between the two alternatives is likely minimal, and that since the Vertical Angle Screen outperforms the Single Vee Screen on all other criteria, Vertical Angle Screen is the preferred alternative.

The participants of the SDM session discussed that the main advantage of the Vertical Angle Screen is that it is less complex in design including the cleaning system, resulting in simpler operation and maintenance requirements compared to the Single V Screen. These features are considered desirable at the Salmon River Diversion which is a remote site where operational challenges could potentially increase the biological impacts.

In addition to discussion around the alternatives for the fish screen, the participants of the SDM session also discussed that the preference for the Vertical Angle Screen is contingent upon adoption of a failure mode at the Salmon River Diversion facility which would close the radial arm gate and stop diversion of water into the canal in the event of a screen cleaning system failure.

The screen and bypass will be located in the diversion canal downstream of the radial gate. The proposal is for the Vertical Angled Screen to be attached to the right side of the canal wall at the upstream end and extend downstream toward the left canal wall. The primary screen will span the entire depth of the channel. The screen will lead to a bypass ramp located along the left wall. The right side of the bypass ramp will be lined with a secondary screen to provide additional dewatering area. The bypass ramp will lead out of the diversion canal on the left side. The bypass will lead to a sampling area and then into a bypass pipe which will return the fish to the Salmon River.

A2.3 Scope of Work

Preliminary Design

The Salmon River Diversion fish screen is a component of a larger project for the Salmon River Diversion called the Canal Refurbishment and Fish Passage Improvement project.

The scope of work for the Definition Phase of the Salmon River Diversion Juvenile Fish Screen Upgrade includes preliminary design components related to the construction a new downstream fish screen with a capacity of 15 m^3/s with automated screen cleaning and removable screens.

Definition Phase work already completed under approved funding, includes:

- Engagement of Comptroller of Water Rights for Definition Phase expenditure associated with the fish screen.
- Conducting a Structured Decision Making session with Agencies and First Nations to develop a recommended alternative for fish screen.

Remainder of Definition Phase (Preliminary Design) requiring additional funding, includes:

- Develop preliminary design of the fish screen component of overall project based on feasibility design recommendations.
- Procure Engineering Consultant for engineering design work.
- Develop preliminary level cost estimate synopsis.
- Update and execute First Nations and Stakeholder Engagement Plans.
- Obtain authorization/permits necessary for construction.
- Develop Safety Minimum Requirements and Environmental Management Plans.
- Prepare documents necessary to seek full Implementation Phase funding approval.
- Conduct a workshop to determine a monitoring plan to measure the effectiveness of the Salmon River Diversion fish screen post construction. (Note: this monitoring plan may result in potential addendum to JHTMON-8 Quinsam and Salmon Rivers Smolt and Spawner Abundance Assessment.)

As part of the Canal Refurbishment and Fish Passage Improvement project, separately funded improvements including upstream fish passage, debris management and flow control management will take place at the head works. These improvements will be in service before the fish screen upgrade takes place. In addition, the configuration of the upstream fish passage is designed to reduce entrainment of upstream migrants into the diversion canal.

A2.4 Schedule

Activity	2015								
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Develop Preliminary Design	■	■	■	■					
Review of Preliminary Design				■	■				
Prepare Preliminary Design Report					■	■	■		
Review/Finalize Design Report							■	■	■

The in service date for the fish screen is expected to be in 2018.

A2.5 Budget

Total Revised Program Cost: $795,861.