Columbia River Project Water Use Plan

Physical Works Terms of Reference Addendum

- **CLBWORKS-27 Lower Columbia White Sturgeon Physical Works: Physical works options to address white sturgeon recruitment failure in the lower Columbia River – Phase 2 Construction Design/Definition**

September 04, 2020

Columbia River Project Water Use Plan

Addendum to CLBWORKS-27 Lower Columbia White Sturgeon Physical Works: Physical works options to address white sturgeon recruitment failure in the lower Columbia River

Physical Works Terms of Reference

1.0 Addendum Rational

This Terms of Reference (TOR) is for the Phase 2 Construction Design/Definition of the CLBWORKS-27 Lower Columbia White Sturgeon Physical Works: Physical works options to address white sturgeon recruitment failure in the lower Columbia River. Following through the TOR dated March 2017, we have completed Phase 1: Hydraulic Modeling and Restoration Option Development for the three identified white sturgeon spawning areas (see West et al. 2020). Phase 1 resulted in a recommendation of restoring spawning substrate at the Keenleyside (ALH) spawning area. Restoration alternatives for the other spawning locations, Waneta and Kinnaird, will not be considered within this TOR given the remaining physical and biological uncertainties.

This TOR is submitted in response to the *Water Act* Order issued by the Comptroller of Water Rights (CWR) on January 26, 2007, Schedule F, Clause 2(a) and Conditional Studies List Clause 10(a). The Order requires TOR for the "physical works options to address credible hypotheses for sturgeon recruitment failure in the lower Columbia River".

2.0 Location

The lower Columbia River is located in the West Kootenay Region of British Columbia and extends 57 km from HLK to the Canada-USA Border. The three white sturgeon spawning areas assessed for feasibility of spawning substrate restoration in Phase 1 of this project included Keenleyside (ALH; river kilometer (rkm) 0.1), Kinnaird (rkm 13.4 to 18.4) and Waneta (rkm 56.0; Figure 1). ALH was the only recommended candidate to continue on to Phase 2 Construction Design. This white sturgeon spawning area of interest is immediately downstream of Hugh L. Keenleyside Dam and Arrow Lakes Generation Station (Figure 2); both facilities provide a source of inflow, with the primary area of egg deposition being immediately downstream of the ALH facility. Spawning at the ALH area has been previously documented at this location with geographical boundaries described by Terraquatic Resource Management (2011; Figure 1).

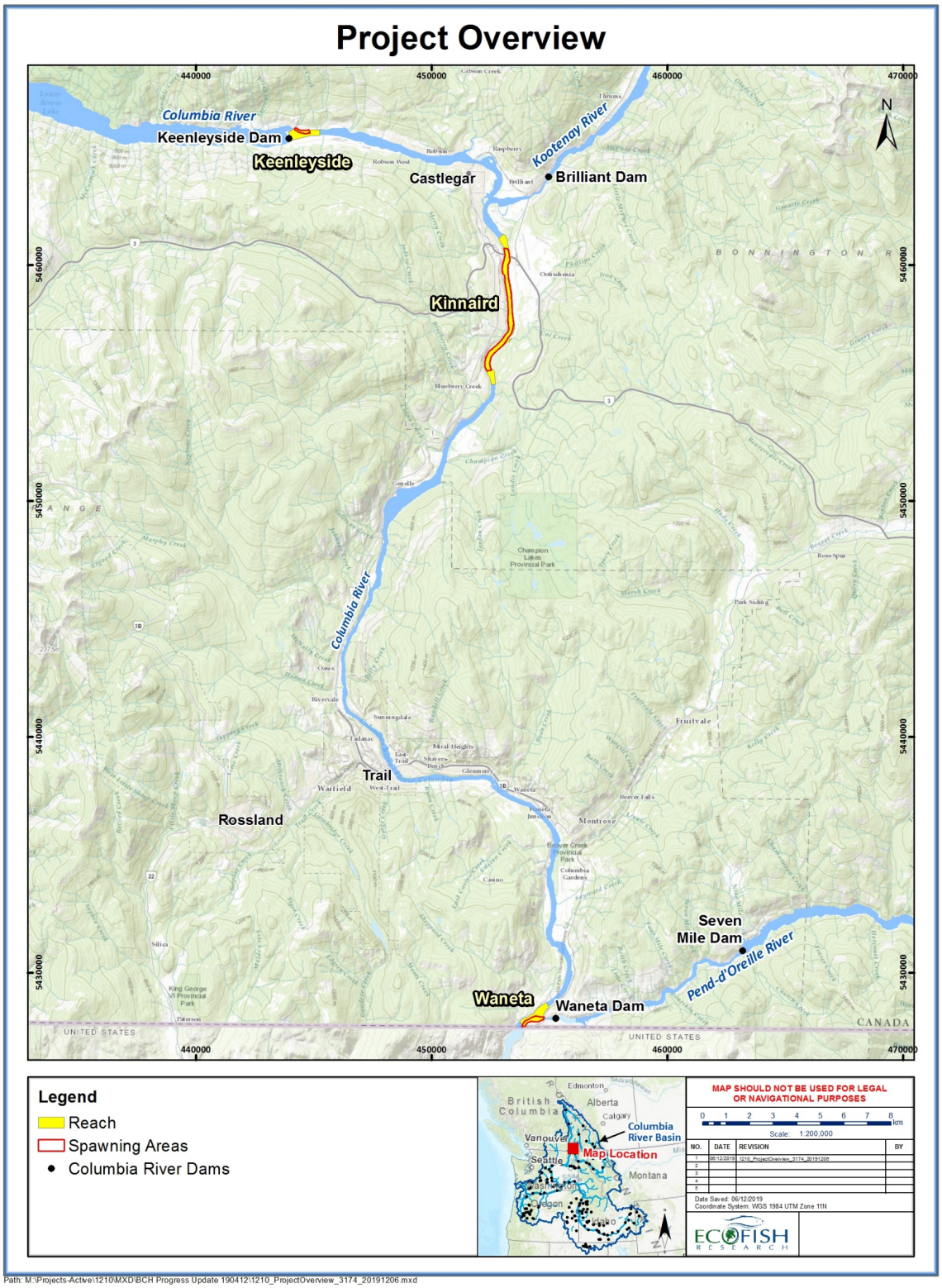

Figure 1: Location map of the identified white sturgeon spawning areas in the lower Columbia River, Canada (West et al. 2020). Spawning areas include Keenleyside (ALH; rkm 0.1; A), Kinnaird (rkm 13.4 – 18.4; B), and Waneta 9rkm 56.0; C).

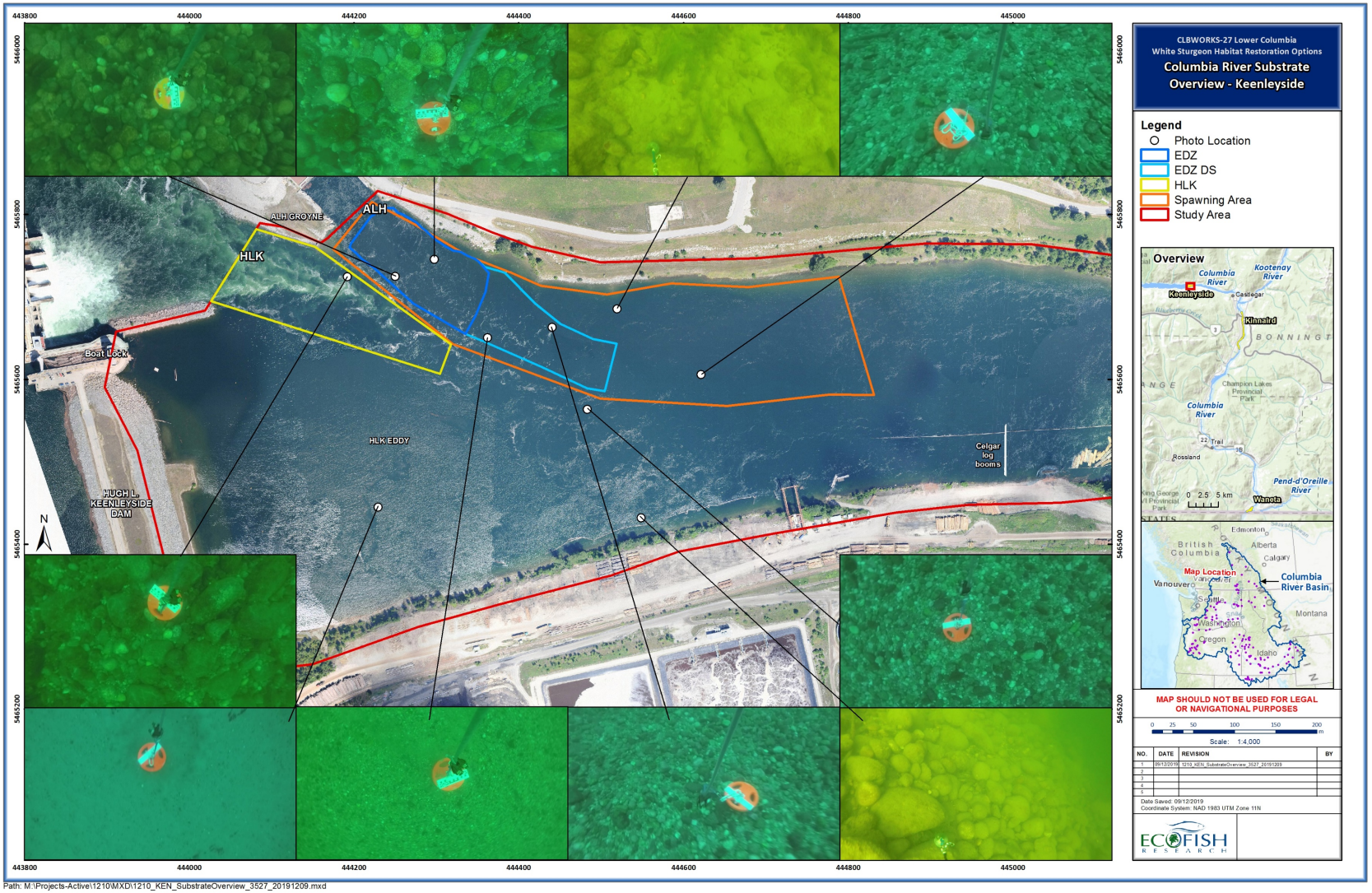

Figure 2: Location map of the ALH white sturgeon spawning area recommended for restoration (West et al. 2020). Potential sites of substrate restoration include the egg deposition zone (EDZ) and downstream of the egg deposition zone (EDZ DS).

3.0 Project Approach

The project will be completed in three phases: 1) Hydraulic Modeling and Restoration Option Development, 2) Construction Design/Definition, and 3) Implementation, which could include pre- and post-project effectiveness monitoring (e.g., biological). This TOR includes only Phase 2: Construction Design/Definition. CWR approval will be sought before proceeding to the Implementation phase as project scope and associated costs will be better understood. The three phases for this project are described further below.

3.1 Phases of CLBWORKS-27

3.1.1 Phase 1: Hydraulic Modeling and Restoration Option Development

This phase was completed in July 2020 with an overall objective to determine the biological and technical feasibility of spawning substrate restoration at three spawning locations on the lower Columbia River (West et al. 2020). A background review of existing hydrological, geomorphic, and biological conditions in the lower Columbia River was completed, as well as a summary of white sturgeon habitat requirements and previous restoration efforts for white sturgeon in other locations. Restoration feasibility was assessed through field data collection and modelling-based analysis of existing substrate, hydraulics, sediment transport, and biological conditions within each of the three study areas. Sediment transport models were generated to predict habitat suitability at multiple flows for current and post-restoration conditions. Habitat suitability was assessed using the hydraulic simulations and sediment conditions to generate spatial predictions of recruitment and spawning suitability, and identify locations of high potential for successful restoration. West et al. (2020) recommended restoration at the ALH spawning area by placing a mixture of multiple grain sizes that will be stable and resistant to fines infilling.

3.1.2 Phase 2: Construction Design and Definition

This phase will be addressed in this TOR and will involve developing a detailed construction design and cost estimate for restoration at ALH based on the recommended options emerging from Phase 1 Hydraulic Modeling and Restoration Option Development (West et al. 2020). The detailed design will include detailed drawings, final methodology, and refined cost estimates. This phase will also include the design of monitoring programs, the collection of required pre-construction baseline data, and regulatory, environmental and archaeological risk assessments. The design and monitoring development will need to align with requirements for all relevant regulatory approvals and First Nations and stakeholder reviews as appropriate. BC Hydro will seek CWR approval at the end of this phase, prior to proceeding to the Implementation Phase.

3.1.3 Phase 3: Implementation and Monitoring

This phase will be addressed in a subsequent TOR and will involve the implementation and completion of the detailed design developed during Phase 2 Construction Design. This phase will also include obtaining any outstanding permitting; construction of the detailed design; and completion reporting including

ongoing maintenance, post-construction monitoring, and effectiveness monitoring as required.

3.2 Recommended Restoration Alternative from Phase 1

The Phase 1 workshop participants, including First Nations, regulators, industry and sturgeon biologists, concluded the placement of substrate material at ALH within and downstream of the egg deposition zone (EDZ; see Figure 2) was the highest priority restoration alternative and this will be pursued in Phase 2 (see West et al. 2020 for summary of workshop). The recommended alternative involves placement of stone mixtures with specific size classes to promote biological functionality and physical longevity across the entire EDZ. The design should consider longevity and risk tradeoffs as outlined in Table 20 of West et al. (2020). Reducing the prescribed placement material size classes by 10% for the initial placement may be beneficial because i) the material will be less likely to infill; ii) it will be more mobile during higher flows flushing fines that may have aggraded; iii) periodic transport may be necessary to create interstitial spaces; and iv) some of the material transported downstream will continue to provide high quality substrate. The design should also consider placement in half of the prescribed area to allow for monitoring of transport conditions for the treatment vs control area and inform material placement for the entire spawning area.

4.0 Linkages with Other Lower Columbia River Water Use Plan Projects

Results of this study will help address the CLBMON-28 (BC Hydro 2016a) and CLBMON-29 (BC Hydro 2016b) objectives of assessing white sturgeon spawning site selection and determining the effects of river operations on larval habitat and survival.

5.0 Phase 2: Construction Design

The main objectives of this phase are to finalize the design for a multiple grain size substrate restoration at the ALH white sturgeon spawning location; initiate permitting and regulatory approval processes; conduct environmental and archaeological assessments; and develop plans for construction and effectiveness monitoring. The outcome will be a detailed design that can be constructed during Phase 3. These objectives are identified and discussed as separate tasks below. Considerations for all tasks are provided in West et al. (2020).

5.1 Task 1: Design and Specifications

Site-specific plans will be developed for the recommended restoration option at ALH spawning area. A site visit may be conducted if deemed necessary. The design plans include, but not limited to:

- Develop engineering specifications: Design standards for engineering will meet professional standards and will be reviewed by BC Hydro or BC Hydro's representative (e.g., owner's engineer) and other relevant parties (e.g. Columbia Power Corporation);

- Undertake a Constructability Review: Establish construction methods, timing of work, equipment requirements, site work layouts and constraints (e.g., flows). It

is generally expected that the constructed work will occur prior to the start of spawning in that year; with construction occurring in late winter or early spring.

- Prepare construction cost estimates: This may involve tendering, early stage procurement, or other estimation methods to ensure construction cost estimates are within the +15%/-10% tolerances.

5.2 Task 2: Support Regulatory Approvals and Permitting

Identify required regulatory approvals, timelines, and permits and provide information to support applications. BC Hydro will be the applicant. Due to permitting timelines, applications will be submitted as soon as all information is available. This will occur prior to Phase 3 ToR submission to allow for construction work to begin shortly after Phase 3 approval. If Phase 3 is not approved, applications will be rescinded.

5.3 Task 3: Environmental Assessment and Environmental Management Plan

In developing the Construction Design, a registered professional biologist (RPBio) will be responsible for ensuring that sensitive areas near the proposed works have been identified, proposing alternative design options as required, suggesting methods for avoiding impacts, or providing mitigation plans. These environmental requirements will be incorporated into an Environmental Management plan.

The RPBio will also be responsible for liaising with the necessary environmental regulatory agencies to confirm regulatory requirements are built into the design.

5.4 Task 4: Heritage Chance Find and Stop Work Procedure

Project related machine disturbances are limited to instream works only. The near shore lands in the project area have been previously screened as having low remnant potential for archaeological deposits, resulting from significant previous disturbances. A nearby archaeological site has been recommended for Legacy status, as it is no longer believed to be present in its recorded location. Heritage risk will be managed during construction under BC Hydro's Archaeological Chance Find and Stop Work Procedure and supported through BC Hydro's Archaeological Awareness training.

5.5 Task 5: Develop Relevant Plans for Construction

Construction-related plans and timelines will be developed for managing the work during construction. These include, but not limited to, the following:

- Communications plan: covering the signs, notifications, site closure notices etc. during construction;

- Safety Plan / Public Safety Plan: for managing public access to the site during construction; and

- Final Environmental Management Plan: for managing environmental risks during construction.

- Final Heritage Management Plan: for managing archaeological risks during construction.

5.6 Task 6: Develop Physical and Biological Monitoring

A pre- and post-construction monitoring program will be developed to assess the effectiveness of the restoration design and determine if intended benefits were met. Monitoring should include both physical (e.g., stability, longevity) and biological (e.g., spawning success, recruitment success) components (West et al. 2020). Monitoring should be coordinated with ongoing studies under the White Sturgeon Management Plan for the lower Columbia River.

5.7 Task 7: Reporting and Technical Review

A report will provide results of Tasks 1 through 5 for review by BC Hydro, agency, stakeholders and First Nations.

6.0 Schedule

This work is scheduled to occur from December 2020 to August 2021. The anticipated breakdown of work is provided in the following table:

Task	Date	Deliverable
Task 1 – Design and Specifications	January 2021 (TBD)	Site visit (if necessary)
Task 1 – Design and Specifications	April 30, 2021	Draft Design and Specifications for review by BC Hydro, agency, stakeholders and First Nations
Tasks 2 – 6:	January – August 2021	Provide support as needed for permit submission. Complete environmental and archaeological assessments.
Task 7 – Reporting and Technical Review	June 15, 2021	Draft Report including tasks 1 and 3 through 6 for review by BC Hydro, agency, stakeholders and First Nations
Task 7 – Reporting and Technical Review	August 31, 2021	Final Report

7.0 Budget

Total Revised Program Cost: $645,348

8.0 References

BC Hydro. 2016. Lower Columbia River Adult White Sturgeon Monitoring Program (CLBMON-28). Year 8 Data Report. Report by BC Hydro, Castlegar, 56 pp.

BC Hydro. 2016b. Lower Columbia River Juvenile detections Program (CLBMON-29). Year 8 Data Report. Report by BC hydro, Castlegar, BC, 88 pp.l

Terraquatic Resource Management. 2011. Arrow Lakes Generating Station white sturgeon Spawn monitoring Program. Report for Columbia Power Corporation, Castlegar B.C. 19 p.

West., D. T., M. J. Bayly, A. D. Tamminga, T. Perkins, L. Porto, M. Parsley and T. Hatfield. 2020. CLBWORKS-27 – Lower Columbia White Sturgeon Habitat Restoration Alternatives – Final Report. Consultant's report prepared for BC Hydro and Power Authority by Ecofish Research Ltd. July 27, 2020.