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Our File No. 2023-01-09

August 16, 2023

The Honourable Dianne Lebouthillier
Minister of Fisheries, Oceans and the Canadian Coast Guard
Minister's Office, 200 Kent St
Station 15N100
Ottawa, ON, K1A 0E6

VIA EMAIL: DFO.Minister-Ministre.MPO@dfo-mpo.gc.ca

Dear Minister Lebouthillier,

RE: ALLEGED *FISHERIES ACT* OFFENCES OCCURRING AT KOOTENAY LAKE WEST ARM, BC

We at the Environmental Law Centre at the University of Victoria write to you on behalf of our client, the British Columbia Wildlife Federation ("BCWF"), as well as yaqan nukiy (Lower Kootenay Band). The BCWF and yaqan nukiy have serious concerns about ongoing harm to fish and fish habitat occurring in the West Arm of Kootenay Lake, British Columbia, due in part to longstanding hydroelectric operations in the region. In this letter we present evidence that this harm contravenes s. 35 of the *Fisheries Act* (the "Act"). The West Arm is within the traditional territory of the Ktunaxa Nation and the homelands of yaqan nukiy The Ktunaxa Nation is comprised of the four Ktunaxa governments in Canada and two in the United States.

Kootenay Lake, a large lake comprised of several "arms," is located in the interior of British Columbia. The West Arm, which stretches between the towns of Belfour and Nelson, is home to numerous populations of kokanee salmon. The Canadian hydroelectric operations impacting Kootenay Lake include Corra Linn Dam (owned and operated by FortisBC), Duncan Dam (BC Hydro), and Kootenay Canal (BC Hydro). A fourth dam, Libby Dam, is owned and operated by the US Army Corps of Engineers and is located upstream of Kootenay Lake in Montana, USA. These hydroelectric operations have affected lake levels and have completely changed Kootenay Lake's natural hydrology. In this letter, we explain how this drastic shift in lake levels has decimated the West Arm kokanee salmon populations by impacting spawning grounds and food availability.

Pursuant to s. 35 of the Act, dam operators must have authorization from the Department of Fisheries and Oceans ("DFO") to cause harm to fish and fish habitat. To our knowledge, none of the dams affecting Kootenay Lake have these authorizations with respect to the West Arm. As a result, there are

no mandatory mitigation measures in place to require FortisBC and BC Hydro to protect West Arm kokanee salmon. This grievous oversight has allowed harm to kokanee fish to occur unchecked for decades, and the once healthy and thriving West Arm fishery has dramatically declined. The BCWF and yaqan nukiy request that the Minister investigate this matter and, if the Minister finds that a s. 35 offence is occurring, it is incumbent on the Minister to impose all appropriate penalties for past harm, and all available mitigation measures to reduce future harm to the Kootenay Lake West Arm fishery.

CONTENTS

1. THE KOOTENAY LAKE WEST ARM KOKANEE SALMON ARE IN TROUBLE

The West Arm kokanee salmon have a unique lifecycle that is dependent upon the health and relative stability of shoreline vegetation. This critical shoreline habitat is impacted by hydroelectric operations in the Kootenay watershed. As a result, the once thriving kokanee salmon population has dramatically reduced.

Kootenay Lake is located in the southern interior of BC, between the Selkirk and Purcell Mountain ranges. It is one of the largest lakes in BC, made up of three distinct regions: the North Arm, the South Arm, and the West Arm. The North and South Arms make up the "main lake," with a length of 107 kilometres and a depth of 100 metres. Duncan River and Kootenay River (called Kootenai River in the US) are both major rivers that flow into the main lake. The West Arm is fed by the flow exiting the main lake and terminates near Nelson, BC. From there it becomes the Kootenay River again, which eventually joins the Columbia River as the only major outflow from the lake. The West Arm is much narrower and shallower than the main lake, with a length of 35 kilometers long and a depth of 13 metres.[1] These characteristics are precisely what make the West Arm important spawning habitat. See Appendix A for a map of the lake.

West Arm kokanee are morphologically and genetically distinct from their main lake counterparts.[2] They are made up of two distinct subpopulations: the stream-spawning kokanee and the shore-spawning kokanee.[3] The shore-spawners have a particularly unique life cycle. During their fall spawning period, they lay their eggs in the shoreline gravels associated with ground water, in structures referred to as "redds." The eggs hatch in the spring, and the kokanee fry emerge and move onto the littoral area of the lake. The fry reside on the shoreline for several weeks before moving to the open waters of the West Arm.[4] The stream-spawner fry also spend at least a month in the littoral zone after emerging in the spring.[5] Thus the health of vegetation in the littoral area of the West Arm is critically important for both shore and stream spawning kokanee.

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[1] AMEC Americas Limited: AMEC Earth and Environmental, "West Arm Kootenay Lake Foreshore Inventory Monitoring (FIM) Analysis" (2009), report prepared for Fisheries and Oceans Canada, at pgs. 8-9.

[2] Lemay, MA & Russello, MA, "Genetic stock identification of kokanee salmon from Kootenay Lake, British Columbia" (2011), University of British Columbia, Okanagan Campus, Kelowna, BC, cited in Thorley et al, "West Arm Kokanee Shore Spawning 2019: The Percentage of Dewatered Redds of Shoal Spawning Kokanee (Oncorhynchus nerka) in the West Arm of Kootenay Lake under Historical, Current and Alternative Operations" (2019), prepared for FortisBC, at pg. 1.

[3] Veale, A & Russello, MA, "West Arm Kokanee Shoal Spawning Genetic Analysis" (2015) University of British Columbia, Okanagan Campus, Kelowna, BC, cited in Thorley et al, "West Arm Kokanee Shore Spawning 2019: The Percentage of Dewatered Redds of Shoal Spawning Kokanee (Oncorhynchus nerka) in the West Arm of Kootenay Lake under Historical, Current and Alternative Operations" (2019), prepared for FortisBC, at pg. 1.

[4] Andrusak, H, Andrusak, G, & Munro, G, "Observations, Preliminary Analysis and Comparison Between Shore and Stream Spawning Kokanee (Oncorhynchus mykiss) in the West Arm of Kootenay Lake" (2007) Nelson, BC, at pgs. 5, 68 ["***Andrusak, Andrusak, Munro***"].

[5] Andrusak & Northcote (1999), cited in *Andrusak, Andrusak, Munro* at pg. 5.

The West Arm kokanee were once a sought-after sport fish. Today, their numbers are dramatically reduced, and the Kootenay Lake fishery is exceedingly limited due to their low numbers. Pre-1980, sport fishing in the lake was wildly popular with resorts populating the upper West Arm. At its peak, the fishery yield was over 100,000 fish per year.[6] However, in the 1980s, the fishery collapsed, and most resorts closed. Research on the streams that feed the West Arm (where 90% of kokanee spawn) suggests that kokanee numbers dropped from 20-30,000 spawning fish per year in the 1970s, to less than 5,000 by the early 1980s[7] and today fluctuate between 5-7,000.[8] The next section will discuss how the fishery collapse was caused, in large part, by hydroelectric operations in the watershed, which reduced nutrient retention in the main lake and altered the lake levels and hydrology.[9]

2. HYDROELECTRIC OPERATIONS IN KOOTENAY LAKE HAVE CAUSED A DECLINE IN WEST ARM KOKANEE

There is no question that the construction and ongoing operation of the dams run by BC Hydro and FortisBC in the Kootenay watershed have altered the lake levels and hydrology of the West Arm. There is also evidence that these changes to lake levels have significantly altered and or reduced West Arm kokanee habitat and affected key steps in their lifecycle. As mentioned, there are three dams in DFO's jurisdiction that impact Kootenay Lake: Corra Linn, Duncan, and Kootenay Canal.

Corra Linn Dam is owned by FortisBC and is located downstream of the West Arm. Corra Linn was constructed in 1932 but did not store water until 1939. Currently, the dam serves two main functions: flood control and hydroelectricity generation.[10] Flood control is regulated by the International Joint Commission ("IJC"). A 1938 IJC Order sets the upper limits for the water levels in Kootenay Lake throughout the year. This Order requires that Corra Linn be used to lower lake levels before the start of the spring freshet, which usually occurs around April. Starting in February, lake levels must not exceed: 1,744 feet on February 1, 1,742.4 feet on March 1, and 1,739.32 feet on April 1 (measured at Queen's Bay in the main lake). After this drawdown, the spring freshet causes an increase in lake levels, which, under the terms of the 1938 Order, must not exceed 1,745.32 feet. The initial purpose of these lake-level provisions was to protect downstream Idaho farms from spring flooding.[11]

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[6] Andrusak, H, "Kootenay Lake sportfishery statistics 1978-80 MS" (1981), Fisheries Technical Circular No 53, Ministry of the Environment and Andrusak, H & Brown, C, "Kootenay Lake fisheries management plan 1987-89" (1987) BC Ministry of the Environment, both cited in *Andrusak, Andrusak, Munro* at pg. 4.

[7] *Andrusak, Andrusak, Munro* at pg. 24; Redfish Consulting Ltd, "Analysis of West Arm of Kootenay Lake Kokanee Production and the Sport Fishery" (2002), at pg. 12.

[8] Personal comment by a former fisheries biologist based on current data from provincial records.

[9] Redfish Consulting Ltd, "West Arm of Kootenay Lake kokanee sport fishery and kokanee food habits" (2002), contract report for the Nelson Fisheries Branch of the BC Ministry of Water, Land and Air Protection, at pgs. 1, 14.

[10] Daley, RJ et al, "The effects of upstream impoundments on Kootenay Lake, BC" (1981) Natl Water Res Inst, Scientific Series No. 117, Burlington, ON, at pg. 1 ["***Daley et al 1981***"].

[11] International Joint Commission, 1938 Kootenay Lake Order (1938).

Corra Linn's operations are closely coordinated with Kootenay Canal, which is owned and operated by BC Hydro and generates power from the West Arm outflow. The Kootenay Canal was completed in 1976 and runs parallel to Kootenay River. Under the current method of operation, outflow from the West Arm reaches the Corra Linn Dam forebay and is then diverted into two streams: the southside Kootenay Canal and the northside Kootenay River.[12] The northside Kootenay River contains several run-of-river dams that are also used for power generation. Under its water licence, BC Hydro must ensure that a flow of at least 5,000 cubic feet per second runs through the run-of-river plants before diverting the remaining flow through Kootenay Canal.[13] The companies have agreed to give preference to flows through Kootenay Canal because it generates power more efficiently than the northside run-of-river dams. As a result, BC Hydro and FortisBC *both* control the drawdown of the West Arm from the Corra Linn forebay, and by extension they control the water levels in the lake. See Appendix B for a diagram of this system.

Duncan Dam is a product of the Columbia River Treaty ("CRT"), signed by Canada and the US in 1961. The CRT required, among other things, the construction of Duncan Dam in BC and Libby Dam in Montana for the purposes of flood control.[14] Duncan Dam is located on Duncan River, upstream of the North Arm of Kootenay Lake, and is used as a reservoir for flood control purposes.[15] The construction of Duncan Dam was completed in 1967 and it is owned and operated by BC Hydro. The exact use of water (release and refilling of the reservoir) year to year is variable, and subject to downstream requirements per the CRT. However, in general, from February – March, the reservoir volume is significantly reduced in anticipation of the spring freshet. From July – October, the reservoir is refilled. The largest reservoir releases occur during December and January.[16] This means that the Duncan Dam has dramatically altered the flows from Duncan River into the lake, holding the spring flows back until the winter months. As mentioned above, Duncan Dam is also under the purview of the CPA, and it impacts flows into Kootenay Lake and by extension into the West Arm of the lake.

Libby Dam became operational in 1973, per the CRT guidelines. It is located upstream of Kootenay Lake in Montana, and eventually feeds the lake through the South Arm. The purpose of this dam is for flood control and power generation, and it is controlled by the US Army Corps of Engineers.[17]

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[12] Hamideh, AR, "Optimization of the Kootenay River Hydroelectric System with a Linear Programming Model - A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Applied Science in The Faculty of Graduate Studies (Civil Engineering)" (July 2008), The University of British Columbia, at pgs. 5-7.

[13] Hamideh, AR, "Optimization of the Kootenay River Hydroelectric System with a Linear Programming Model - A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Applied Science in The Faculty of Graduate Studies (Civil Engineering)" (July 2008), The University of British Columbia, at pgs. 19-20;
Province of British Columbia, Conditional Water Licence #C126392 for British Columbia Hydro and Power Authority (2011) file #4005658, s e(1).

[14] *Daley et al 1981* at pg. 1.

[15] *Daley et al 1981* at pg. 1.

[16] Hirst, SM, "Impacts of the operation of existing hydroelectric developments on fishery resources in British Columbia" (1991), report prepared for the Ministry of the Environment, Canadian Manuscript Report of Fisheries and Aquatic Science, Inland Fisheries Vol II, at pg. 64.

[17] *Daley et al 1981* at pgs. 1, 11.

Collectively, the operations of Kootenay Canal, Corra Linn, Duncan, and Libby dams have substantially altered the hydrology of Kootenay Lake, including the West Arm. According to one study, approximately 55% of the inflow into the lake is controlled by the Duncan and Libby Dams.[18] The regulation of water inflows and outflows by these dams have lowered the June freshet peaks by about two metres from their natural levels, while also substantially increasing winter lake levels. This causes winter and summer water levels to be opposite to the natural hydrology of the lake.[19] In the West Arm specifically, this has had a substantial impact on the health of the littoral zone, an area that is critically important for rearing fish.[20]

As mentioned in the previous section, the changed hydrology, specifically the altered lake levels, of Kootenay Lake has impacted two populations of West Arm kokanee salmon: shore-spawners and stream-spawners. Stream-spawners are more prevalent, with 95% of West Arm kokanee originating from two constructed spawning channels compared to 5% from shore-spawning.[21]

Shore-spawners spawn in the fall, at specific sites where groundwater exits, usually associated with adjacent to inflowing creeks. Kokanee fry emerge in early spring.[22] Without the influence of the dams, the levels of the lake during spawning and emergence would be approximately the same. However, due to the hydrologic alterations caused by the Kootenay Canal, as well as Duncan, Corra Linn and Libby Dams, the lake level becomes higher during spawning (fall) than during emergence (spring). As a result, the shore-spawner fertilized eggs become "dewatered" and stranded because they are deposited above the spring watermark. The Kokanee eggs or fry in these dewatered areas are stranded, resulting in high mortality.[23]

Additionally, the altered hydrology also affects stream-spawners. Decreased water levels in the spring, as well as higher water levels in the fall, affect the overall productivity of vegetation in the West Arm's littoral zone, which dries out when the water levels drop in the spring. The littoral vegetation is important for both kokanee spawning populations since both their fry inhabit the littoral zone during their life cycle where they feed on small insects and zooplankton.[24] Notably, the impacts of the dams on West Arm kokanee have also been publicly acknowledged by FortisBC.[25]

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[18] *Daley et al 1981* at pg. 11.
[19] *Daley et al 1981* at pg. 12.
[20] *Daley et al 1981* at pg. 88.
[21] *Andrusak, Andrusak, Munro* at pg. 41.
[22] Andrusak, G, "Assessment of Kootenay lake levels and the impact on recruitment of shore spawning kokanee fry within the West Arm of Kootenay Lake 2015-2016" (2016), prepared for Columbia Operations Fisheries Advisory Council, at pg. 1.
[23] *Andrusak, Andrusak, Munro* at pg. 11.
[24] *Andrusak, Andrusak, Munro* at pg. 39.
[25] FortisBC, "Why environment management plans matter in maintaining reliable energy and wildlife habitats" (2022), online: <https://www.fortisbc.com/news-events/stories/why-environment-management-plans-matter-in-maintaining-reliable-energy-and-wildlife-habitats>; FortisBC, Corporate and Sustainability Report (2020), online: <https://www.fortisbc.com/sustainabilityreport2020/sustainability-in-all-we-do/protecting-the-environment>.

3. FORTISBC AND BC HYDRO ARE JOINTLY RESPONSIBLE FOR THE HARM TO KOKANEE SALMON

Pursuant to the 1972 Canal Plant Agreement ("CPA"), BC Hydro and FortisBC are contractually obligated to operate Duncan, Corra Linn and Kootenay Canal Dams in a coordinated fashion.[26] The CPA specifies that the companies will operate these dams as "one owner."[27]

In the language of the CPA, the companies "cooperate in the operation of their available storages and generating facilities in British Columbia for the purpose of obtaining optimum generation."[28] This connection between the dams is also express in a 2015 annual report from the International Kootenay Lake Board of Control to the IJC. This report refers to the close connection between FortisBCs' Corra Linn Dam's drawdown of Kootenay Lake's West Arm, and BC Hydro's power generation interests:

> *FortisBC staff provided an overview of the Canal Plant Agreement, initially established in 1974 (with subsequent renewals in 2005 and 2011)* ***to allow BC Hydro to make the most efficient use of flow regulation from upstream Duncan and Libby dams and requiring Corra Linn dam to meet certain operational requirements in exchange for a power generation entitlement****.* ***BC Hydro's Kootenay Canal plant draws on the Corra Linn forebay to route flow through a canal*** *to a dam and power plant which discharges back into the Kootenay River after bypassing 4 FortisBC [run of river] power plants on the Kootenay River.*[29]

The CPA mandated cooperation and above statement are evidence of the fact that the operations of the three dams are closely connected, because they all significantly affect the hydrology of Kootenay Lake. In sum, on the Canadian side of the watershed, both FortisBC and BC Hydro substantially control the hydrology of Kootenay lake by partially controlling inflows and entirely controlling outflows. As such, FortisBC and BC Hydro would be jointly and severally liable under the Act for any unauthorized damage to fish and fish habitat in the West Arm.

While the operation of Libby Dam, located upstream in the US, also has an impact on the inflows into Kootenay Lake, the impact of Libby Dam does not diminish the fact that three Canadian dams at issue in this submission are also having a significant effect. Moreover, there is evidence that it is possible to mitigate the damage to West Arm kokanee habitat by feasible adjustments to the operations of these three Canadian dams. These mitigations will be addressed in further detail in Section 5 of this submission.

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[26] Matthews, H, "Kootenay System Overview" (2016) BC Hydro, at slides 5, 9-10.
[27] Matthews, H, "Kootenay System Overview" (2016) BC Hydro, at slide 5.
[28] Matthews, H, "Kootenay System Overview" (2016) BC Hydro, at slide 7.
[29] International Kootenay Lake Board of Control, "Annual Report to the International Joint Commission" (2015), at pg. 7 [emphasis added].

4. FORTISBC AND BC HYDRO ARE NOT COMPLYING WITH SECTION 35(1) OF THE *FISHERIES ACT*

Section 35 of the Act imposes a duty on the DFO to ensure that hydroelectric operations do not cause the harmful alteration, disruption, or destruction ("HADD") of fish habitat, unless authorized.[30] In our review of available documents, we could find no evidence that the DFO has authorized the harms occurring to West Arm kokanee salmon habitat by hydroelectric operations, as described in Section 2 above.

Habitat protection is a key feature of the Act and is governed in part by s. 35. A section 35(1) offence has 3 elements: (1) a work or undertaking or activity, (2) resulting in the harmful alteration, disruption, or destruction of (3) fish habitat. This is a strict liability offence, so it is not necessary to establish intent.[31]

The operations of the Kootenay Canal, Corra Linn and Duncan Dams satisfy all three elements:

1. The operation of a hydroelectric dam is an 'undertaking' per s. 35(1) of the Act.[32] Therefore, the operation of the FortisBC / BC Hydro controlled dams would be an undertaking;
2. HADD is defined as "any change in fish habitat that reduces its capacity to support one or more life processes of fish."[33] As described in section 2, there is substantial evidence that the littoral and shoreline habitat that the West Arm kokanee depend upon is being harmed by the operations of these three dams. These impacts seriously disrupt the life cycle of the kokanee, which contributes to the demonstrated downturn in kokanee populations in the West Arm; and
3. Fish habitat is defined as "water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas."[34] This includes not only the water in which fish travel, but the adjacent land and the vegetation in the stream that contributes to their ability to hatch, eat, grow, migrate, and reproduce.[35] Therefore, the West Arm littoral habitat and streamside redds are "fish habitat" per the Act.

Section 35(2)(b) of the Act gives discretion to the Ministry to authorize activities that would otherwise be liable under s. 35(1).[36] Therefore, if FortisBC and BC Hydro have the requisite permissions from DFO, they are not liable for HADD under s. 35(1). However, we have reviewed all available documents, and we have found that apparently neither FortisBC nor BC Hydro have permits that authorize harm to fish habitat in the West Arm.

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[30] *Fisheries Act*, RSC 1985 c F-14, at s. 35; Note: s. 35(1): "No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat."

[31] *R v BC Hydro And Power Authority,* 1997 CanLII 4373 (BCSC) at para 5.

[32] *R v BC Hydro And Power Authority,* 1997 CanLII 4373 (BCSC) at para 5.

[33] Department of Fisheries and Oceans Canada, "Decision framework for the determination and authorization of harmful alteration, disruption or destruction of fish habitat" (1998), at pg 6.

[34] *Fisheries Act*, RSC 1985 c F-14, at s. 2(1).

[35] *R v Larsen*, 2014 BCSC 2084, at paras 65-66.

[36] *Fisheries Act*, RSC 1985 c F-14, at s. 35.

In November 2022, we corresponded with FortisBC representatives about the company's hydroelectric activities in Kootenay Lake. In this correspondence, we asked Fortis BC whether they have authorizations under s. 35 of the Act for HADD in the West Arm of Kootenay Lake. FortisBC replied in January 2023, confirming that they do not have a HADD permit for the Corra Linn Dam facility.

Despite the lack of HADD permits, FortisBC claimed that the operation of the facility is in compliance with DFO requirements. According to FortisBC, Corra Linn is not required to obtain a licence for the "footprint" impacts of the dam. To support this position, FortisBC cited a 2007 DFO Position Statement on the *Application of the Habitat Protection Provisions of the Fisheries Act to Existing Facilities and Structures*.[37] With respect to the "ongoing operation, modification, and maintenance" of the dam, FortisBC claims to submit "Requests for Review" to the DFO. As FortisBC was unable to provide a copy of one of these documents, we were unable to verify this claim or determine the nature of such requests and reviews.

In any case, even if the "footprint impacts" of the Corra Linn Dam do not require a permit as per the 2007 Position Statement, FortisBC remains legally obligated to seek a HADD permit for any harm caused by the ongoing operations of Corra Linn Dam.[38] We could find no legal basis for the proposition that a "Request for Review" replaces a HADD permit and/or fulfills a relevant obligation under the Act.

BC Hydro would require a HADD permit for two facilities: Duncan Dam and Kootenay Canal Dam. In our correspondence with BC Hydro in 2022, we learned that the Kootenay Canal has no such permit. As for Duncan Dam, we understand that BC Hydro obtained a HADD permit in 2007 on the basis of its Duncan Dam Water Use Plan[39] (see Appendix C for a copy of the HADD permit).

However, there is nothing in the Duncan Dam HADD permit that authorizes harm to fish habitat in the West Arm. Rather, any reference to Kootenay Lake in the permit is in relation to nutrient retention via the Kootenay Lake North Arm restoration program (see Appendix C, Condition 4). While nutrient retention does have an impact on fish, there is evidence that the North Arm nutrient restoration program has not been effective at addressing nutrient retention in the West Arm.[40] In any case, as described in Sections 2 and 3 above, Duncan Dam impacts the West Arm fishery through its control of inflows and therefore it contributes to the altered hydrologic conditions that are harming littoral vegetation and kokanee redds. While there are references in the Duncan Dam HADD to the impacts of the dam on fish spawning and streambank habitat in the Duncan River and surrounding channels, there is no such reference to Kootenay Lake or the West Arm (see Appendix C).

While the Duncan Dam HADD permit is inadequate in the sense that it does not authorize and recognize the full extent of harm to fish habitat caused by Duncan Dam, it is still significant from a factual

[37] Department of Fisheries and Oceans Canada, "Application of the habitat protection provisions of the Fisheries Act to existing facilities and structures" (2007).
[38] Department of Fisheries and Oceans Canada, "Application of the habitat protection provisions of the Fisheries Act to existing facilities and structures" (2007).
[39] BC Hydro, "Duncan Dam Project: Water Use Plan" (2007), signed by Renata Kurschner, Director and Generation Resource Management, BC Hydro.
[40] Andrusak, G, "Feasibility of embayment fertilization on the West Arm of Kootenay Lake" (2008) Habitat Conservation and Trust Fund, Victoria, BC, at pgs. 8-9.

standpoint. This is because the permit recognizes that Duncan Dam regulates flows into Kootenay Lake. This supports our conclusion that Duncan Dam's operations contribute to the overall lake levels and hydrology of Kootenay Lake, thereby also impacting kokanee habitat in the West Arm.

In sum, the coordinated operations of BC Hydro and FortisBC in the Kootenay watershed are causing harm to kokanee salmon habitat in the West Arm, and this harm does not appear to be duly authorized by DFO authorities. As such, we contend that the companies are committing an offence under section 35 of the Act.

5. BC HYDRO AND FORTISBC'S "SELF-REGULATION" HAS FAILED TO ADEQUATELY ADDRESS HARM TO FISH IN THE WEST ARM

The Act stipulates that where HADD has occurred without a permit, a party may nonetheless invoke a defence of "due diligence."[41] In our view, the elements of this defence are not satisfied by either BC Hydro or FortisBC with respect to the West Arm. While there is evidence that both companies are aware of their impact and the harm, their limited mitigation efforts do not satisfy the requirements for the due diligence defence. Moreover, for many years it appears that there was no mitigation at all.

Section 78.6 of the Act establishes the elements of the defense of due diligence. A party must demonstrate that the harm was not reasonably foreseeable, and/or that they took "all reasonable care" to avoid the offence. With respect to damage to fish habitat in the West Arm, this requires information regarding: (1) what the companies knew or should have known about harm to fish habitat, and (2) whether historic and current mitigation activities constitute all reasonable care to avoid the harm.[42]

To understand the issue of reasonable foreseeability and reasonable care, an entity called the Columbia Operations Fisheries Advisory Committee ("COFAC") must be understood. COFAC was formed by BC Hydro and FortisBC, and it invites the participation of DFO staff, relevant BC provincial ministries, and Indigenous representatives. According to its terms of reference, COFAC is meant to provide a forum to exchange information about fisheries and coordinate the activities of hydro projects in the Columbia River system.[43] It is important to note that COFAC has no official or legal status and any company decisions made in this forum are entirely voluntary.

We contend that the harm to fish habitat on the West Arm was reasonably foreseeable. There is evidence that, for at least 15 years, the companies in question have known that their operations are damaging fish and fish habitat in the West Arm due to changes in the lake hydrology. Scientific research

[41] *Fisheries Act*, RSC 1985 c F-14, at s. 78.6.
[42] *R v BHP Diamonds Inc,* 2002 NWTSC 74, at paras 151-152.
[43] Columbia Operations Fish Advisory Committee, "Terms of Reference" (10 May 2018) at pg. 1.

demonstrating this was specifically shared with the companies in a meeting in 2007.[44] There were similar reports from the public and scientists on the harm dating back to 2003.[45] Following the 2007 meeting, COFAC undertook further research and discussion of the issue.[46] This lead to a paper published by COFAC in 2012 that identified an optimal mitigation scenario to reduce HADD in the West Arm, namely by ensuring a lake level of 1742.13 feet during spawning in September and October.[47] In sum, there is strong evidence that harm to fish habitat on the West Arm was reasonably foreseeable and indeed directly known to the companies since at least 2007, and perhaps earlier.

Second, with respect to the question of reasonable care to avoid the event, there is evidence that the companies have adopted *some* of the strategies suggested in 2012 to minimize the harm. Some reports indicate that in 2012, 2015, and 2018, the companies voluntarily decided to respect the optimal 1742 feet fall lake level to decrease the extent of redd dewatering.[48] However, a simple examination of the hydrographs of the Kootenay Lake water levels since 2000 makes it clear that the companies have not consistently respected this limit (see Appendix D).

Company reports regarding mitigation actions illustrate a pattern of mitigation inconsistency. For example, in 2020, FortisBC stated that in "past years we've *lowered lake levels in the fall during peak years of spawning* to encourage the species to spawn at deeper lake elevations to protect as many of the redds as possible from being dewatered or left uncovered where they can dry out due to receding water in the spring."[49] Similar statements were made by BC Hydro in an International Kootenay Lake Board of Control report.[50] Thus, the companies themselves admit that they have decided to adopt this form of mitigation only during high spawning years, even though they also acknowledge that it can be difficult to predict high spawning years with a high degree of accuracy.[51] Despite stating they were only pursuing lake level mitigation in high spawning years, in 2021, FortisBC has also claimed that it is taking yearly mitigation actions on its website: "*we undertake actions every year* to minimize the potential for shoal spawning Kokanee to build redds and spawn in areas that may be above the water line in the

[44] Irvine, RL, Andrusak, H & Andrusak, G, "Assessment of lake levels and their variation on the recruitment of shore spawning kokanee fry within the West Arm of Kootenay Lake" (2012) Columbia Operations Fisheries Advisory Committee, Nelson, BC, at pg. 1.
[45] *Andrusak, Andrusak, Munro* at pg. 11.
[46] Irvine, RL, Andrusak, H & Andrusak, G, "Assessment of lake levels and their variation on the recruitment of shore spawning kokanee fry within the West Arm of Kootenay Lake" (2012) Columbia Operations Fisheries Advisory Committee, Nelson, BC, at pg. 1.
[47] Irvine, RL, Andrusak, H & Andrusak, G, "Assessment of lake levels and their variation on the recruitment of shore spawning kokanee fry within the West Arm of Kootenay Lake" (2012) Columbia Operations Fisheries Advisory Committee, Nelson, BC, at pgs. 11-12.
[48] Thorley et al, "West Arm Kokanee Shore Spawning 2019: The Percentage of Dewatered Redds of Shoal Spawning Kokanee (Oncorhynchus nerka) in the West Arm of Kootenay Lake under Historical, Current and Alternative Operations" (2019), prepared for FortisBC, at pg. 12.
[49] FortisBC, "Corporate and Sustainability Report – Protecting the environment" (2020), online: <https://www.fortisbc.com/sustainabilityreport2020/sustainability-in-all-we-do/protecting-the-environment> [emphasis added].
[50] International Kootenay Lake Board of Control, "Annual Report to the International Joint Commission" (2021), at pg. 11.
[51] International Kootenay Lake Board of Control, "Annual Report to the International Joint Commission" (2021), at pg. 11.

spring."[52] In the document cited there is no further information about what these reportedly annual mitigation actions consist of.

Periodic or partial mitigation fails to meet the legal standard of *all reasonable care* to avoid the harm. While perfection is not required, in this case the companies appear to be exercising their discretion to exceed the optimal lake levels level in some years, while knowing that this increases the harm to kokanee salmon habitat. They conduct this piecemeal mitigation while knowing, for at least the past 15 years, that their operations are causing harm to kokanee habitat and that more effective mitigation is possible. At the same time there appears to be no regulatory oversight to require companies to adopt a better course of mitigation or to verify their compliance with it.

Based on the evidence cited above, we conclude that the defense of due diligence is not likely available to FortisBC and BC Hydro. The harm to kokanee salmon habitat has been reasonably foreseeable since at least 2007. Following this, it took the companies 5 years to identify mitigation strategies, and even then, the companies have not committed to consistently ensuring optimal fall lake levels despite their knowledge that this would minimize harm to fish.

On this basis, we conclude that FortisBC and BC Hydro have likely *knowingly* harmed fish and fish habitat in the West Arm in contravention of the Act since at least 2007. However, as addressed in previous sections, the harm itself has occurred over several decades since the dams were constructed and this impact is cumulative. Moreover, at present the companies have adopted only partial mitigation measures and the harm is ongoing.

6. REQUEST

The ongoing operations of hydroelectric companies FortisBC and BC Hydro in the Kootenay watershed have substantially altered the hydrology of Kootenay Lake. This alteration has negatively impacted kokanee salmon habitat in the West Arm of the lake, drastically reducing the health of the fishery. As such, these activities contravene s. 35 of the Act, which prohibits the harmful alteration, disruption, or destruction of fish and fish habitat. Neither FortisBC nor BC Hydro have the requisite permits for the HADD they are causing on the West Arm, and they have not done their due diligence to avoid the offence. The companies have been aware of the HADD on the West Arm for at least 15 years and have not fully implemented available mitigation measures to lessen the impact on fish.

We respectfully call on the Minister to conduct an urgent investigation into this apparent contravention of the Act and to impose all appropriate penalties for past harm, and all available mitigation measures to reduce future harm. It is alarming that federal regulators have not already used their mandates and powers to protect kokanee salmon in the West Arm. We have not been able to identify a single instance

[52] FortisBC, "Corporate and Sustainability Report" (2021), at pg. 23 [emphasis added].

of federal regulatory protection or policy in place for kokanee salmon in the West Arm, despite decades of well-documented hydroelectrical impacts on this invaluable species.

Sincerely,

Charis Kamphuis

Dr. Charis Kamphuis
Environmental Law Centre, University of Victoria

"Haley Richardson"

Haley Richardson, Law Student
Environmental Law Centre, University of Victoria

"Lisa Harris"

Lisa Harris, Articled Student
Environmental Law Centre, University of Victoria

Jesse Zeman

Jesse Zeman, Executive Director
BC Wildlife Federation

M. Jason Louie, nasukin (Chief)
yaqan nukiy - Lower Kootenay Band

APPENDIX A: MAP OF THE KOOTENAY LAKE SYSTEM

Figure 1: This image shows the major dams, lakes, and rivers within the Kootenay Lake system.[53]

[53] Note: We obtained Figure 1 from the US Army Corps of Engineers and is part of the public domain. The image can be found at the following link: <Pacific_Northwest_River_System.png>.

APPENDIX B: KOOTENAY SYSTEM SCHEMATIC MAP

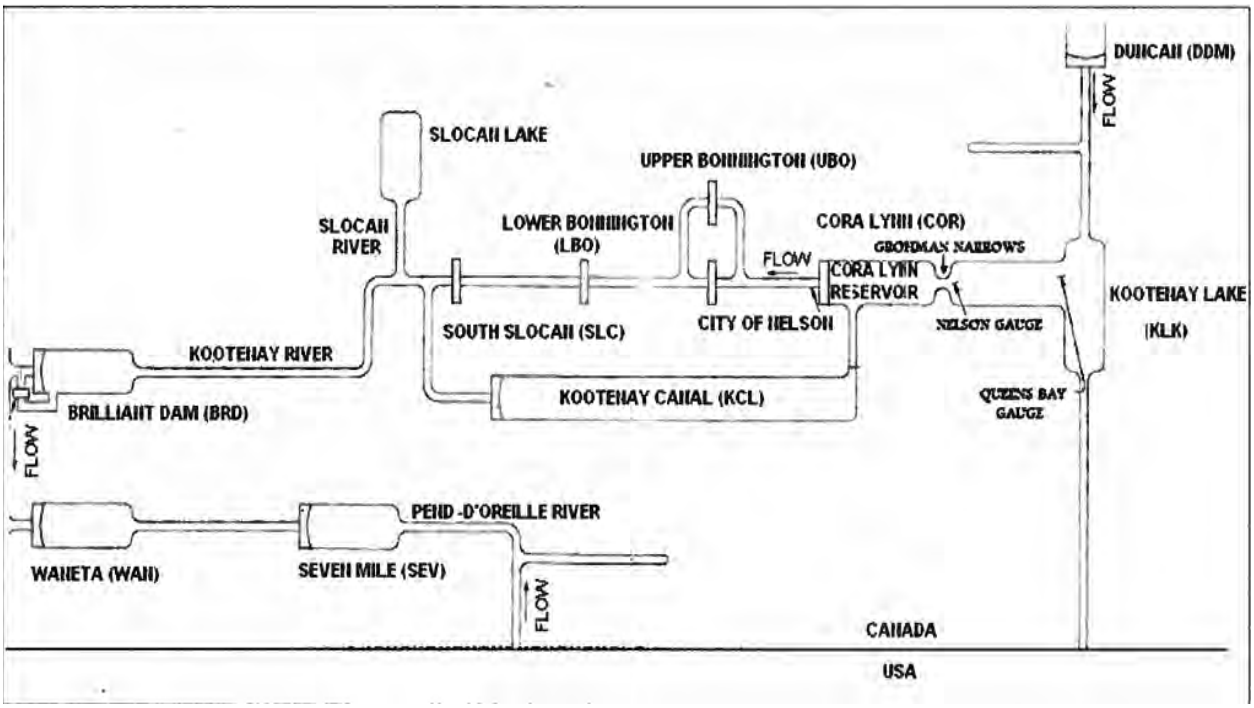

Figure 2: The map of the Kootenay area schematics. This image illustrates the major inflows and outflows of the Kootenay Lake system, as well as the dams and canals regulating flow within that system.[54]

This image illustrates the major inflows and outflows of the Kootenay Lake system, as well as the dams and canals regulating flow within that system.

[54] Hamideh, AR, "Optimization of the Kootenay River Hydroelectric System with a Linear Programming Model - A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Applied Science in The Faculty of Graduate Studies (Civil Engineering)" (July 2008), The University of British Columbia, at pg. 5.

APPENDIX C: DUNCAN DAM HADD PERMIT

Fisheries and Oceans Canada | Pêches et Océans Canada

Fisheries and Oceans Canada
Habitat Management Program
200 – 401 Burrard Street
Vancouver, BC, V6C 3S4

Your file
2010-WUP-DDM-01

July 8, 2011

Our file:
11-HPAC-PA6-00011

Kevin Conlin
Manager, Compensation and Compliance
BC Hydro
6911 Southpoint Drive
Burnaby, BC, V3N 4X8

Subject: *Fisheries Act* Authorization for Duncan Dam Project

Pursuant to Sections 32 and 35(2) of the *Fisheries Act*, Fisheries and Oceans Canada (DFO) is providing the enclosed *Fisheries Act* Authorization for impacts to fish and fish habitat arising from the operation and maintenance of the Duncan Dam hydroelectric facility in accordance with the Duncan Dam Water Use Plan (WUP) and the Project Maintenance Annex.

The Authorization requires mitigation of impacts, including year round minimum flow release and ramping rates as specified in the WUP, as well as other measures related to maintenance activities. All of these measures will be evaluated through various assessments as part of an overall monitoring program, which is intended to determine whether the WUP, and other measures, are working to conserve and enhance local fish populations.

This Authorization does not permit the destruction of fish due to entrainment, an issue that BC Hydro is addressing at their facilities, on a priority basis, through implementation of the Fish Entrainment Strategy (2005). Based on the outcome, this Authorization may require amendment to include entrainment-related mortality as well as associated mitigation and/or compensation measures, as appropriate.

A copy of the attached Authorization should be kept on site, and operations and maintenance personnel should be familiar with, and able to adhere to, its conditions. Failure to comply with all the conditions of this Authorization may lead to prosecution under the *Fisheries Act*.

Canada

If you or others conducting activities subject to this Authorization have any questions please contact Michael Crowe at our Kamloops office via phone at 250-851-4963 or e-mail at michael.crowe@dfo-mpo.gc.ca.

Sincerely,

Byron Nutton, RPBio
A/Team Leader, Habitat Management Program
Fisheries and Oceans Canada, Pacific Region

Fisheries and Oceans Canada | Pêches et Océans Canada

FISHERIES ACT S. 35(2) and S. 32 AUTHORIZATION

BCH # 2010-WUP-DDM-01
PATH #11-HPAC-PA6-00011

AUTHORIZATION FOR WORKS OR UNDERTAKINGS CAUSING THE HARMFUL ALTERATION, DISRUPTION OR DESTRUCTION OF FISH HABITAT AND DESTRUCTION OF FISH.

Authorization issued to:

Name: BC Hydro and Power Authority ("BC Hydro")

Address: 6911 Southpoint Drive, Burnaby, BC V3N 4X8

Contacts: Environmental and Social Issues Manager, Castlegar, 250-365-4576
Natural Resource Specialist, Castlegar, 250-365-4561

Location of Project

Duncan Dam Project, Duncan River, north of Kaslo, BC (56° 15' N; 116° 57' W).

Valid Authorization Period

The valid authorization period is from 11 May 2011 until such time as this Authorization is replaced pursuant to Condition 6 or is modified or rescinded pursuant to Condition 2, and is conditional upon BC Hydro undertaking a review of the Water Use Plan with Fisheries and Oceans Canada (DFO) prior to 21 December 2019. If the review has not commenced by 21 December 2019, this Authorization will terminate, and regardless of the foregoing this Authorization will terminate by 21 December 2021 at the latest.

Description of Works or Undertakings

The Undertaking under consideration is the operation of the Duncan Dam Project hydroelectric facility, located on the Duncan River, which flows into the north end of Kootenay Lake. The project consists of Duncan Reservoir and Duncan Dam, which includes an earth-filled dam, two discharge tunnels, and a concrete spillway. The components and operations of these facilities are described in the **Duncan Dam Project Water Use Plan**, dated 20 December 2007, and its companion document, the **Duncan Dam Water Use Plan Consultative Committee Report**, dated September 2005. These documents are attached as Annexes 1 and 2, respectively.

The harmful alteration, disruption or destruction of fish habitat (S. 35(2)) and the destruction of fish (S. 32) hereby authorized are described below, and are related to activities associated with the operation of the above facilities in compliance with Annexes 1 and 2. This document does not authorize any other harmful alteration, disruption or destruction of fish habitat or destruction of fish.

The harmful alteration, disruption or destruction of fish habitats hereby authorized are:

a) impacts related to changes in potential spawning and rearing habitats in the Duncan River, as a result of operations of Duncan Dam in compliance with Annexes 1 and 2, and/or project maintenance (Annex 3);

b) impacts related to loss of streambank habitat in the Duncan River channel, as a result of operations in compliance with Annexes 1 and 2, and/or project maintenance (Annex 3);

c) impacts related to elevated Total Gas Pressure (TGP) levels in the Duncan River, as a result of operations in compliance with Annexes 1 and 2, and/or project maintenance (Annex 3); and

d) impacts related to reduced nutrient flow from Duncan Reservoir to Kootenay Lake, as a result of operations in compliance with Annexes 1 and 2, and/or project maintenance (Annex 3).

The destruction of fish hereby authorized is the stranding and Gas Bubble Trauma-related mortality of fish in the Duncan River, as a result of operations and/or project maintenance (Annex 3), and the incidental mortality of fish, by stranding or other means, as a result of the fish transfer operation at Duncan Dam, so long as the water levels have been affected by BC Hydro in compliance with the operational procedure described in Annexes 1 and 2.

Conditions of Authorization

1. BC Hydro confirms that all operating specifications relating to the Water Use Plan (Annex 1) have been duly prepared and reviewed by appropriate professionals working on behalf of BC Hydro. BC Hydro acknowledges that it is solely responsible for all design and safety aspects of all of the operations associated with this Authorization, which in no way shall be construed to diminish or limit any rights or recourse that BC Hydro may have against its contractors or consultants in relation to either design, safety or workmanship aspects of the works associated with this Authorization or the failure of any contractors, consultants or others to comply with conditions of this Authorization.

2. The Water Use Planning process, and the resulting operational plan, includes assumed benefits and impacts to the local fisheries resource, which are the subject of the monitoring program for this hydro facility. If the interim monitoring results and/or other observations indicate that the benefits or impacts to the fisheries resource are significantly different from those originally projected, DFO may modify or rescind this Authorization. DFO will not take this action without explaining its concerns to BC Hydro and providing it an opportunity to respond. In addition DFO will consult First Nations and Provincial agencies who may be affected by such proposed action.

3. Mitigation will be provided by BC Hydro operating within the confines of the WUP (Annexes 1 and 2) by the provision of:

- a minimum daily average flow release from Duncan Dam, which is expected to maintain continuity of fish habitat in the Duncan River between the dam and the confluence with the Lardeau River;
- year-round minimum and seasonal maximum flow targets in the Duncan River downstream of the Lardeau River confluence, which are expected to maintain and enhance fish habitat in the Duncan River;
- a TGP Procedure, whereby flow releases from Duncan Dam are routed to limit spill volumes, which is expected to minimize elevated TGP levels in the Duncan River;
- a maximum up-ramp rate for flow releases from Duncan Dam, which is expected to reduce loss of streambank habitat in the Duncan River;
- a maximum down-ramp rate for flow releases from Duncan Dam, and a fish stranding management strategy (Annex 4), including the identification of flow regimes, refined ramping rates, and physical works, which are expected to reduce fish stranding in the Duncan River;
- a fish transfer operation, as permitted by operational conditions, whereby fish are enabled to pass through Duncan Dam to the Duncan Reservoir, which is expected to facilitate the upstream migration of bull trout from the lower to the upper Duncan River system;
- watering of rainbow trout redds in the Duncan River that are dewatered as a result of flow reductions to facilitate the installation and removal of the fish transfer weir at Duncan Dam; and
- measures to address impacts associated with facility maintenance, as described in Annex 3.

4. Compensation will be provided by BC Hydro, operating within the confines of the WUP, by the provision of:

   - in lieu of a lower water level in Duncan Reservoir to reduce the frequency of high flow events, erosion protection measures in the Argenta Slough, which are expected to reduce the impacts of high flows on the quality and quantity of available habitat;
   - in lieu of a lower minimum flow in the Duncan River during the kokanee spawning period, an action plan for monitoring of sidechannel use, assessment of exclusion methods, and implementation of physical works where appropriate, which is expected to reduce the risk of kokanee stranding in Duncan River sidechannels; and
   - in lieu of a more stable water level in Duncan Reservoir to maximize the flow of nutrients into Kootenay Lake, partial funding of the nutrient loading program in the North Arm of Kootenay Lake, which is expected to enhance productivity and increase fish abundance and diversity in the lake.

   The effectiveness of these measures will be monitored as specified in Annexes 1 and 2.

5. BC Hydro shall, as a condition of this Authorization and in accordance with the Duncan Dam Project Water Use Plan, undertake the fish and fish habitat

monitoring programs described in Section 5 of the Water Use Plan (Annex 1). BC Hydro shall communicate with and provide terms of reference and reports (http://www.bchydro.com/planning_regulatory/water_use_planning/southern_interior.html#Duncan_Dam) to DFO Regional and Area contacts during the development and implementation of the monitoring studies to demonstrate that the monitoring program meets the intent of reducing the uncertainties associated with the planned operating regime.

6. BC Hydro shall continue to perform all of the operational obligations of this Authorization until the Duncan Dam Project Water Use Plan review is completed and any changes in operations that result from that review are implemented. At that time an assessment of the necessity and terms for a *Fisheries Act* Authorization, as it relates to the new operational plans, will be undertaken, and if appropriate, a revised Authorization issued.

7. If BC Hydro transfers its interest in the Duncan Dam Project and the Transferee assumes the ongoing intent and obligations of this Authorization in a manner satisfactory to DFO, BC Hydro shall thereafter be relieved of these obligations.

8. In the event of an impact to fish habitat or destruction of fish that requires investigation, DFO, the BC Ministry of Environment (MoE), and BC Hydro will undertake investigation of the matter as described in the Compliance Protocol (Annex 5) and, where required, BC Hydro will undertake any Corrective Action, as described in the protocol.

9. When BC Hydro is aware of upcoming events respecting the Duncan Dam Project which may significantly alter the normal water flows or levels in this system, is aware of other changes to such flows or levels which may raise significant concerns with DFO or the public, or generates a fish- or fish habitat-related environmental incident report, BC Hydro shall contact and advise the following as early as it can:

    - Fisheries and Oceans Canada, Conservation and Protection Program Coordinator, Kamloops (Telephone: 250-851-7704, Fax: 250-851-7717), and in the event that an environmental incident report is generated, the DFO Conservation and Protection Radio Room (1-800-465-4336).
    - Fisheries and Oceans Canada, OHEB Manager, BC Interior Area, Kamloops (Telephone: 250-851-4870, Fax: 250-851-4951).

10. BC Hydro shall meet with DFO and MoE approximately once per year (or as required) to discuss WUP operations, physical works, monitoring results, and proposed maintenance of the Duncan Dam Project that may affect fish or fish habitat. These meetings will allow all parties to discuss any potential impacts of proposed maintenance works that are not included in Annex 3, and determine if notification, variance, advice or *Fisheries Act* Authorization or amendment is required. DFO may require that potential impacts be monitored, and the parties agree that a desired outcome of the annual meetings may be a jointly approved work practices list for this facility.

Fisheries and Oceans Canada | Pêches et Océans Canada

The holder of this authorization is hereby authorized under the authority of section 32 and subsection 35(2) of the *Fisheries Act*, R.S.C., 1985, c. F. 14 to carry out the works, undertakings, activities and/or operations as described herein. This authorization is valid only with respect to fish and fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

This Authorization does not permit the deposit of a deleterious substance in water frequented by fish. Subsection 36(3) of the *Fisheries Act* prohibits the deposit of any deleterious substances into waters frequented by fish except under conditions that can only be authorized by regulations made by Governor in Council.

At the date of issuance of this Authorization, aquatic species listed under the *Species at Risk Act*, S.C., 2002, c.29 (SARA) were not identified within the project location. In the event that a SARA listed species is identified or an aquatic species becomes listed under SARA, this authorization does not permit harm, harassment or killing of any species at risk (SARA section 32), the damage or destruction of residence (SARA section 33) or the destruction of critical habitat (SARA section 58).

Failure to comply with any condition of this authorization may result in charges being laid under the *Fisheries Act*.

This authorization should be held on site and work crews should be made familiar with the conditions attached.

The Proponent shall advise DFO in advance if the ownership or responsibility for the conditions of this authorization changes.

Date of issuance: May 11, 2011

Approved by: Jon Hwang

Title: Area Manager, BC Interior
Oceans, Habitat and Enhancement Branch
Fisheries and Oceans Canada

Fisheries and Oceans Canada | Pêches et Océans Canada

BC Hydro and Power Authority confirms that it has reviewed and understands the terms of this Authorization, and agrees that it will comply with them.

Executed by an authorized signatory of BC Hydro and Power Authority on the 18th day of MARCH 2011 in the presence of:	BC Hydro and Power Authority
Witness (signature)	Per: Authorized signatory
Bruce Misewich (print name)	CHRIS O'RILEY Name
	EVP GENERATION Title

Fisheries and Oceans Canada | Pêches et Océans Canada

ANNEXES to *Fisheries Act* Authorization # 2010-WUP-DDM-01

Annex 1. Duncan Dam Project Water Use Plan, 20 December 2007

Annex 2. Duncan Dam Water Use Plan Consultative Committee Report, September 2005

Annex 3. Duncan Dam Project Maintenance

Annex 4. Duncan Dam Fish Stranding Management Strategy (Draft), December 2004

Annex 5. Compliance Protocol, 8 March 2006

Annex 1 – Duncan Dam Project Water Use Plan

http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/wup_duncan_dam_project_water_use_plan_december_2007.Par.0001.File.wup_duncan_dam_project_water_use_plan_december_2007.pdf

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Annex 2 – Duncan Dam Water Use Plan Consultative Committee Report

http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/wup_duncan_executive_summary.Par.0001.File.wup_duncan_executive_summary.pdf

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Annex 3 - Duncan Dam Project Maintenance, December 2010[1]

To # 2010-WUP-DDM-01

Introduction

This annex describes facility maintenance required to operate the Duncan Dam Project in accordance with the Water Use Plan (WUP), as referenced in the *Fisheries Act* Authorization.

The Duncan Dam Project includes all infrastructure related to the storage and conveyance of water and may include but is not limited to:

- Duncan Reservoir
- Duncan Dam
- Low level outlet gates (LLOG)
- Low level operating tunnel discharge channel
- Spillway gates
- Spillway discharge channel

Maintenance refers to inspection, repair, refurbishment and/or replacement of components of the infrastructure that allows for the operation of the Duncan Dam facility within the constraints of the Duncan Dam Project Water Use Plan, dated 20 December 2007. Maintenance activities with the potential to impact fish and fish habitat were considered to be those that can result in:

- A change in water flows or levels, outside of routine WUP operations, and/or sediment transport, in:
  - Duncan Reservoir
  - Duncan River downstream of Duncan Dam
- Physical work within the area associated with the WUP operating range of water elevation or flow.

Assessment

For the purposes of this Authorization, anticipated maintenance activities for the Duncan Dam Project were identified by BC Hydro, and an assessment of potential risks to fish and fish habitat associated with these activities was conducted in accordance with DFO's Risk Management Framework (www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/risk-risques_e.asp). Based on the risk assessment, specific criteria were developed to identify maintenance activities that would be included in the Authorization. Note that all of the following criteria must be met for a maintenance activity to be authorized:

- Activity represents Low to Medium risk of impact to fish and fish habitat (as determined by a Qualified Environmental Professional (QEP)[2] using the DFO Risk Management Framework);

[1] The list of authorized activities identified in Table 1 of this document is subject to change, following the process described herein, based on maintenance requirements at this facility. The latest version of this annex is available on the BC Hydro website.

- Changes in flows and/or water levels are within the parameters (i.e., magnitude, timing) of the WUP;
- Physical work occurs within the WUP operating range of water elevation or flow;
- Work is performed on existing infrastructure; and
- Mitigation measures (as described below) are in place.

Mitigation
To reduce or eliminate potential negative impacts to fish and fish habitat, the following mitigation measures will be applied for each maintenance activity:

- Water licence requirements, as they pertain to fish needs, will be maintained;
- Maintenance activities will be coordinated and synchronized;
- Practical and appropriate mitigation measures will be applied to all physical works; and
- BC Hydro's environmental best management practices and environmental standards will be followed, and for Medium risk activities will involve a QEP developing an activity-specific plan that specifies 1) potential environmental impacts; 2) environmental protection, mitigation and compensation measures; and 3) environmental monitoring and incident reporting requirements.

A fish stranding protocol, which prioritizes data collection sites and requirements for flow reductions, is also currently in place for the Lower Duncan River and will be implemented as required.

Eligibility
A variety of typical maintenance activities at the Duncan Dam Project were evaluated in terms of scope of work, timing, potential effects on fish and fish habitat, and appropriate mitigation measures. Those maintenance activities that meet the criteria outlined above and are therefore included in the Authorization are identified in Table 1.

The eligibility, notification, and review requirements for each risk category of maintenance activity are outlined below:

- **Low Risk**: Activities that represent a Low risk to fish and fish habitat and that are identified on Table 1 can proceed, in accordance with the requirements specified above, without notification of DFO Area staff.
- **Medium Risk**: Activities that represent a Medium risk to fish and fish habitat and that are identified on Table 1 can proceed, in accordance with the requirements specified above, following notification of DFO (by submission of online form at www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm). In the event that a potential impact cannot be mitigated, the BC Hydro QEP will notify DFO Area staff to determine whether DFO

[2] Qualified Environmental Professional: an applied scientist or technologist specializing in a relevant applied science or technology and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise, and who, in British Columbia is registered with their appropriate professional organization, and acting under that association's Code of Ethics and subject to disciplinary action by that association (DFO Habitat Management Program, Pacific Region).

review is required. BC Hydro will undertake appropriate monitoring to assess the efficacy of the response and any effects on fish and fish habitat.

- **High Risk**: Activities that represent a High risk to fish and fish habitat risk are excluded from this Authorization, and require separate review by DFO (www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm).

Other Low and Medium risk maintenance activities that meet the criteria described above but which are not yet identified in Table 1 may proceed upon the review and approval of DFO. Such activities if they recur should be added to Table 1 for inclusion in the Authorization.

Exclusions

Any maintenance activities not identified in Table 1 are considered to be outside the scope of this Authorization. Examples of major infrastructure works and activities that would be excluded from this Authorization include:

- Seismic upgrades;
- Dam or spillway reconstruction; and
- Generating Station upgrade or replacement.

Table 1. Typical maintenance activities at the Duncan Dam Project. If these eligible maintenance activities are conducted in accordance with mitigation requirements (e.g., existing EMPs), they would be included in the present *Fisheries Act* Authorization. For any maintenance activities that represent a Medium risk to fish and fish habitat, DFO will be notified and a BC Hydro QEP will develop an activity-specific environmental management plan.

Maintenance Activity	Description	Estimated Timing	Operations/Physical Works Required	Potential Impacts to Fish and Fish Habitat
Reservoir debris removal	During reservoir/headpond operations, woody/organic debris can accumulate at the Duncan Dam intakes.	As required, based on inspection. Generally in summer during high inflows/full pool.	Debris removal from booms and trash racks using crane and boat. Operations as per water licence requirements.	Loss of woody debris. Physical displacement and/or injury of fish. **Risk: Low**
Water passage maintenance	Maintenance of gates, valves and low level outlet tunnel.	Generally once per year for gates and valves and every five years for the low level outlet tunnel. Low level outlet tunnel maintenance occurs during low water elevation in forebay.	Low level outlet tunnel is dewatered. Operations as per water licence requirements.	Stranding in low level outlet flip bucket. **Risk: Low**
Vegetation management	Vegetation growing on and around the dam can degrade the structure, cause safety concerns or impede inspections. Vegetation is managed by hand and/or machine near the waterway.	Annually, in the late spring and mid-summer.	None.	Impacts to riparian areas. Loss of streambank habitat. **Risk: Low**

Maintenance Activity	Description	Estimated Timing	Operations/Physical Works Required	Potential Impacts to Fish and Fish Habitat
Spillway Operating Gate (SPOG) and Low Level Operating Gate (LLOG) testing	During monthly testing each gate is opened one foot then closed immediately to original position. During annual testing gate is opened full travel. Gate testing required as part of Dam Safety program.	Monthly and annually.	Gate is opened. Monthly SPOG testing is performed when the forebay elevation is above the gate sill. Annual SPOG testing is performed when the forebay elevation is below the gate sill. LLOG testing is performed monthly and yearly.	Stranding and elevated TGP downstream of the spillway and LLOGs. **Risk: Low**

APPENDIX D: CHANGES IN KOOTENAY LAKE WATER LEVELS OVER TIME

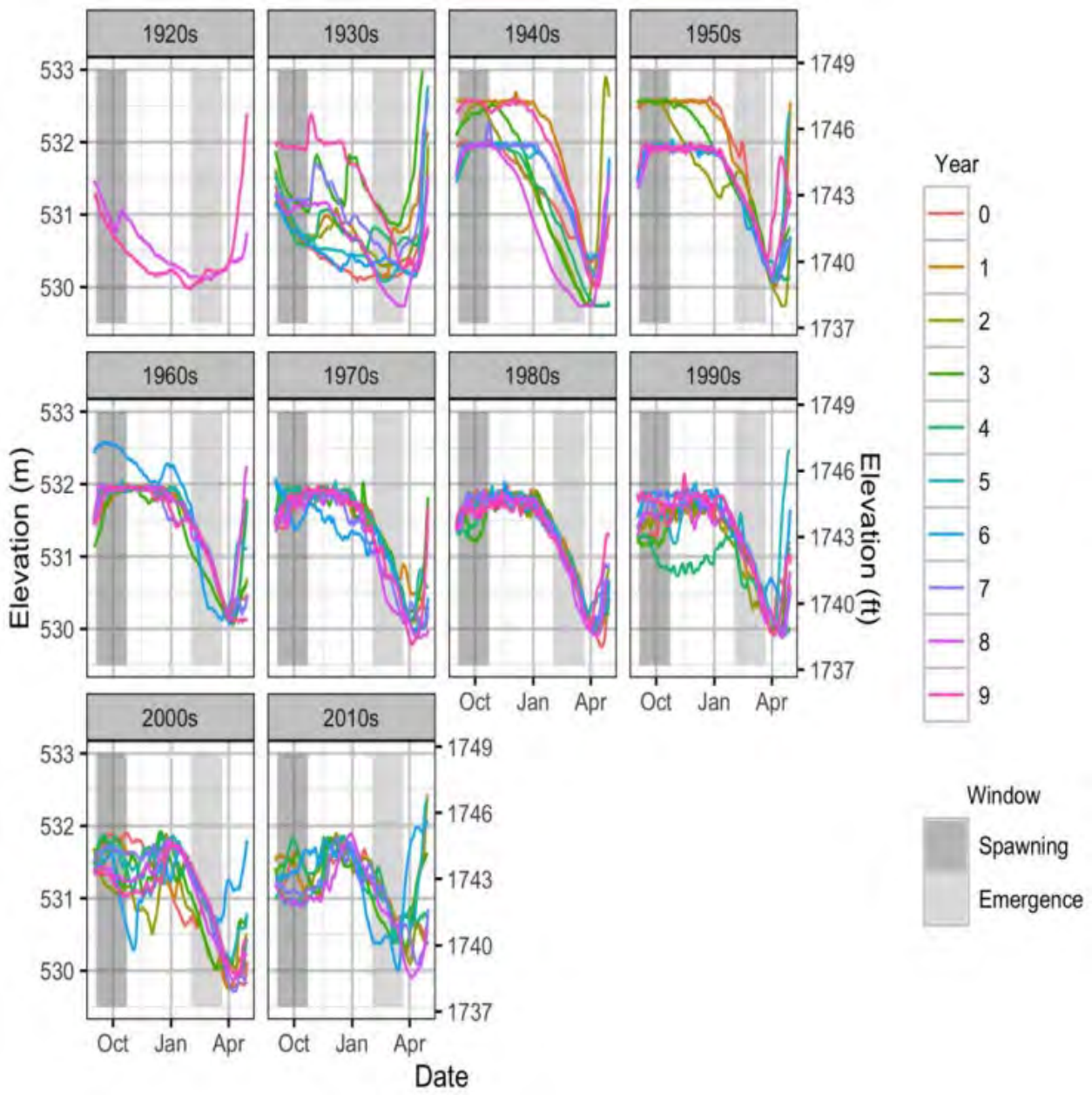

Figure 3: Daily lake elevation at Queens Bay by date, decade, year.[55]

[55] Thorley et al., "West Arm Kokanee Shore Spawning 2019: The Percentage of Dewatered Redds of Shoal Spawning Kokanee (Oncorhynchus nerka) in the West Arm of Kootenay Lake under Historical, Current and Alternative Operations." (2019) Prepared for FortisBC.

Figure 3 illustrates how the Kootenay Lake water levels have changed after the introduction of the hydroelectric dams, as well as the ongoing mitigation efforts by COFAC. The levels in the 1920s and the early 1930s reflect the watershed's natural state before the dams were built. The first major shift in lake levels occurred after the introduction of the Corra Linn Dam in 1939. The second major change occurred after the introduction of the Duncan and Libby Dams in the 1960s-70s.

This figure also illustrates the ongoing mitigation efforts by COFAC. Starting in the late 2000s, the fall water levels were kept lower during some years in order to make them more equal with the spring water levels. This is meant to decrease the dewatering of the kokanee spawning grounds. However, the 2000s and 2010s graphs also show that the lake levels appear to frequently exceed this limit. As such, the graphs illustrate that the companies' mitigation efforts have been inconsistent.