

## Backgrounder to British Columbia Instream Flow Guideline Documents

### Why are guidelines needed?

The allocation of water rights is an essential component of many economic opportunities but water allocation decisions can be controversial if they are perceived to impact on other values, such as the fishery resource. Further, defining the instream flow requirements required to sustain healthy fish populations has been a significant source of debate in many jurisdictions, including British Columbia. There are typically two related areas of uncertainty: 1) establishing the appropriate methodologies to assess fish-flow requirements; 2) interpreting the assessment to define how much flow is required to maintain productive fish populations.

The emergence of small hydroelectric project development by Independent Power Producers (IPPs) as a major component of the province's energy policy has emphasised the need for effective tools to assess the instream flow requirements necessary to maintain the productivity of aquatic environments. In the absence of such tools, the instream flow issue has often become a bottleneck in the regulatory review process. The current approach of determining impact assessment methodologies and interpretations on a site-specific basis can lead to inconsistency when addressing flow issues.

Further complicating the situation is the governance issue. Water allocation decisions are made by statutory decision-makers under the provincial *Water Act*. However, small hydro projects may significantly alter the hydrograph on waters that directly or indirectly support fish populations and may, therefore, negatively affect fish habitat through reduced or altered flow regimes. If these impacts are considered to constitute a "Harmful Alteration, Disruption or Destruction" of fish habitat (HADD) as defined under federal policy, then the Department of Fisheries and Oceans (DFO) must also provide an authorization under the federal *Fisheries Act*. Establishing a unified set of guidelines with respect to fish flow issues will provide greater certainty for IPP proponents before and during project reviews.

### Objectives

The primary objective in producing these guidelines is to facilitate a timely review of small hydroelectric proposals with respect to fisheries and aquatic ecosystem values.

By clearly defining the information requirements and appropriate methodologies we hope to enable proponents to consistently provide the quality of data required by regulators. Further, flow thresholds have been used to define areas of greater uncertainty (with respect to fish habitat impacts) and data requirements have been designed to reflect the level of uncertainty.

Taken together, the methodology guidelines and the flow thresholds will enhance the consistency and transparency of the aquatic impact review process. This should facilitate timely decisions that support economic opportunity while sustaining productive aquatic habitats.

### **The Guidelines: what are they and how were they developed?**

Assessing instream flow-needs for fish is a developing science with a variety of methodologies that often need to be adapted to local conditions. In British Columbia, our understanding in this area has been greatly improved through Water Use Planning, a process to assess and modify operations at BC Hydro facilities with the objective of improving benefits for fish and other non-power values. The guidelines presented here were developed by a technical working group composed of staff from several provincial agencies, the federal Department of Fisheries and Oceans, BC Hydro and consulting scientists. Drafts of the guidelines underwent a series of reviews including workshops involving a broad spectrum of biologists, hydrologists and regulators.

There are two guideline documents. The first product details the information requirements related to fish, fish habitat, water quality and hydrology. This document also provides the preferred methodology for collecting that information in British Columbian waters. The guidelines detail both a coarse and a fine scale of information collection which relate directly to the determination of instream flow thresholds (see below).

The second product relates to flow thresholds. In attempting to develop flow threshold guidelines for British Columbia, the technical working group reviewed both the available science and the approaches used by other jurisdictions. While some approaches were clearly more appropriate for the situation in British Columbia there is no universal method available that is ideal for establishing a flow regime that conserves aquatic ecosystem values. The difficulty originates with the incredible diversity of geology and climate that exists in British Columbia leading to an equally diverse range of habitats, aquatic communities and flow regimes.

Given this diversity, and the inherent uncertainty that exists in defining flow requirements, the working group reached consensus on an holistic approach for defining flow thresholds whereby the stream's historic flow patterns are used as the key reference point. Flow thresholds are calculated using historic, natural flows and are expected to maintain specific aquatic ecosystem values (processes). These values include: physical habitat; water quality; channel maintenance; flushing flows (sediment cleaning); and, periodic flood pulses. The flow threshold guidelines differentiate between fish bearing and fishless systems. For fish bearing systems the threshold is more dynamic as it reflects changing requirements dependent on season and on what fish species or life-stages are present. In fishless systems, the focus is on maintaining basic ecosystem

functioning by providing a minimum flow. As such, a greater portion of the flow is typically available for diversion in fishless systems.

### **What is the expected utility and limitation of each?**

The flow threshold is not a decision rule and does not define whether or not a given project should be approved. Rather, the thresholds essentially identify where the area of uncertainty is with respect to the effects of water extractions or diversions on environmental values. The flow threshold can be used as a “coarse filter” to allow proponents to assess whether negative impacts to fish are likely to occur before undertaking more costly assessments. Understanding the magnitude of the difference between a proposed water diversion rate and the flow threshold for fish will help proponents prioritize which projects to invest in and will ultimately simplify and reduce costs associated with the review. Defining the threshold for any given system requires only basic information (as defined in the methodology guidelines).

Where a proposed extraction exceeds the threshold value, the proponent has the option of addressing the uncertainty by undertaking more detailed, stream-specific studies to better quantify the potential impacts as well as to identify the mitigation and compensation opportunities.

The ‘historic flow’ approach was tested against a wide variety of BC streams for which significant data existed. The approach was also tested against recent statutory decisions for IPP projects. Overall, the approach was found to be reasonably conservative with respect to protecting aquatic values. For coastal ‘rain-driven’ watersheds the historic flow approach resulted in recommendations similar to previously used methods. The results were less consistent for snow-driven and rain-on-snow watersheds. In some of these latter cases, technical staff concluded that the threshold underestimated that amount of water that could be diverted without significantly impacting fish. However, attempts to modify the approach further to reflect differences in watershed type were not seen as productive as there was no suite of characteristics that would clearly classify subsets of watersheds that could be treated separately.

While it is likely that many small hydro proposals (especially in fish-bearing watersheds) will want to conduct more detailed assessments to evaluate the maximum flow available, the guidelines will still result in a more streamlined, consistently applied and transparent review process.

In summary:

- It is expected that any project (or portion of a project) that can operate within the threshold flows will not result in a HADD. While it is acknowledged that many small hydro projects (as initially proposed by proponents) may not meet these thresholds, the guidelines are a transparent rationale to support decisions on any water-use proposal in the absence of detailed hydraulic or biological data.

- The instream flow thresholds will help identify where the most significant issues are with respect to protecting aquatic values. As such, they will assist proponents and regulators in screening projects at an early stage in the review process.
- **The thresholds provide a significant differential in preferred flows when comparing fish-bearing to fishless systems. While fishless systems still require minimum flows to protect ecosystem values, there is a considerably higher portion of the flow available for diversion. This provides an incentive to consider fishless systems for development where the overall impacts may be lower.**
- Where more detailed, site-specific studies are required, the information needs and methodology guidelines support the consistent collection of quality data by proponents to inform decisions.
- The utility of the assessment guidelines is not limited to the evaluation of small hydro proposals as they can be similarly applied to assessing the potential impacts from any proposed water extraction where an environmental impact assessment is required.

### **How will guidelines be used and what future activities need to be undertaken?**

The guidelines are considered to be working documents that should be evaluated and improved over time. It is appropriate at this stage to 'ground-truth' the guidelines by incorporating them into the review process for small hydroelectric projects. Feedback from this process will inform future revisions.

The methodology guidelines are considered to be a comprehensive 'menu' of information requirements associated with assessing potential impacts to fish, fish habitat and related aquatic ecosystem values. However, it is recognized that not every project will require the same level of detail in every data category. Advice may be provided by responsible agencies in this regard however, proponents should engage appropriately qualified professionals to design and implement assessment programs

It is further recognized that, for most streams, there will be insufficient historic flow data to estimate flow thresholds. In these cases, flow data can be synthesized (modelled) based on watershed size, climatic considerations and flow records that exist for comparable watersheds. While there are some inherent uncertainties with the use of synthetic flow records it is possible to reduce the level of uncertainty over time if appropriate monitoring programs are established. Monitoring may be in the best interests of the proponent as it may demonstrate the availability of more water than initially estimated using conservative flow models.

Finally, it is important to reiterate that the guidelines are not a decision process in and of themselves. The guidelines support decision making by identifying aquatic values and the likely consequences of alternative project designs with respect to

water use. However, water use decisions ultimately need to consider both the risks to environmental values and the potential societal/economic benefits. The guidelines do not speak to this decision process.