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***Hydraulic Measurements in Reservoirs: Capabilities and Limitations.***\*Mathew T. Langford; C. Beth Robertson; David Z. Zhu, Department of Civil and Environmental Engineering, University of Alberta.

**Abstract**

The construction of a hydropower dam can have a drastic change on the physical morphology of regional water resources. In addition, hydropower operations can have a significant impact on the flow field of water within the forebay, and on established aquatic ecosystems upstream of these facilities. Employing concepts of environmental sustainability and protection of aquatic habitat, it is important that the effect of upstream hydropower hydraulics be investigated as it relates to fish entrainment risk assessment.

The instrumentation that is currently available for the field investigation of velocity fields is typically limited to river current metering devices and acoustic devices such as the acoustic Doppler velocimeter (ADV) and the acoustic Doppler current profiler (ADCP). Typically the acoustic devices are better suited for the measurement of limnic flows due to the relatively low velocity, and the dynamic nature of flows in lakes and reservoirs. When completing hydraulic measurements in these water bodies it is important to consider water quality factors, specifically salinity and quality of seeding as these may reduce the correlation of measured data. As the velocity in lakes and reservoirs is relatively low in magnitude, the fluctuation in velocity measurements, contributed both by turbulence and the instrument, may be relatively large. The amplitude of this fluctuating velocity component may be greater than the magnitude of the mean velocity. It is therefore important that velocity measurements are time averaged over the course of each measurement to ensure that a representative mean velocity is obtained. This corresponded to averaging in excess of 50 measurements at each point at the Hugh Keenleyside dam forebay, however is anticipated to vary from site to site.

Additionally, other environmental factors (such as reservoir depth, bed cover and bathymetry), and instrument capabilities (range, ping rate, beam angle, bin size) should be clearly identified prior to field investigation of forebay hydraulics. When properly executed, ADCP measurements have been found to closely match computational fluid dynamic modelled results, validating the strength of acoustic measurements in deep reservoirs.