Spillimacheen Project
Water Use Plan

Revised for Acceptance by the Comptroller of Water Rights

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Preface

The water use planning process for BC Hydro’s Spillimacheen facility was initiated in May 2002 and concluded in April 2003.

The operating conditions proposed in this Water Use Plan reflect the consensus recommendations of the Spillimacheen Water Use Plan Consultative Committee.

BC Hydro thanks all those who participated in the process that led to the production of this Water Use Plan. The proposed conditions for the operation of BC Hydro’s facilities will not come into effect until implemented under the Water Act.
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1.0 INTRODUCTION

The operating conditions proposed in this Water Use Plan reflect the consensus recommendations of the Spillimacheen Water Use Plan Consultative Committee. The basis for the proposed terms and conditions to be authorized under the Water Act for the beneficial use of water at the Spillimacheen hydroelectric project are set out in this document. Future reference to the Spillimacheen project includes the following: Spillimacheen Dam and headpond and Spillimacheen generating station and tailrace.

The proposed conditions will result in minor changes to current operations, which are expected to benefit fish.

A monitoring program is also proposed in order to study key uncertainties to enable improved operating decisions in the future. Refer to the Spillimacheen Water Use Plan: Consultative Committee Report dated August 2003 for details on the consultative process, interests, objectives, performance measures, key trade-offs, values associated with operating alternatives, expected benefits and the proposed monitoring program. A review period has also been specified for this Water Use Plan.

2.0 DESCRIPTION OF WORKS

2.1 Location

The Spillimacheen River is located within the Regional District of East Kootenay, in southeastern British Columbia, approximately 40 km north of Radium Hot Springs near the rural communities of Brisco and Spillimacheen. The facilities are easily accessible via a secondary road that runs west off Highway 95 at Spillimacheen, BC.

2.2 Existing Works

The Spillimacheen project consists of the following works:

**Spillimacheen Dam:** The Spillimacheen Dam is located on the Spillimacheen River about 5 km upstream of its confluence with the Columbia River. The concrete dam is 41.5 m (metres) long and has a maximum height of 14.5 m. Water release facilities consist of a freeflow overflow spillway (El 864.03 m)\(^1\) with flashboards (El 865.56), a log sluice (El 862.81 m), a gated undersluice (El 858.09 m), and a power intake (El 860.07 m).

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\(^1\) Datum relative to Geological Survey of Canada (GSC).
The gated undersluice at the dam is kept at least partially open throughout the year to reduce the amount of sediments passing through the generating units and to allow movement of gravels from within the headpond.

**Spillimacheen Headpond:** The Spillimacheen Dam impounds a small headpond, (2.4 hectares surface area) which has an active storage capacity of 58,320 m³ (cubic metres).

The normal non-freshet headpond operating level is El 865.56 m which is the top of the 1.53 m high flashboards. The headpond is maintained close to this level to provide the best conditions for flow into the power intake and provide additional head for power generation. When the flashboards are in place, the water level of the headpond is regulated within a 0.4 m range.

**Spillimacheen Generating Station:** The Spillimacheen generating station is located about 1.5 km downstream of the dam on the left bank (north side) of the Spillimacheen River. It contains three Francis turbines with a total generating capacity of 4 MW (two 0.9 MW capacity turbines and one 2.2 MW capacity turbine), with room for a fourth unit. Water is delivered to the generating station from the Spillimacheen headpond through a 1.1 km long tunnel to a surge tower. From the surge tower, two short steel penstocks carry the water to the generating station. There is a short tailrace downstream of the generating station that connects to the Spillimacheen River. Under normal operations the total discharge capacity of the units is 8.25 m³/s.

Figure 2-1 shows the general layout of the Spillimacheen project.
Figure 2-1: Map of Spillimacheen Project
3.0 HYDROLOGY OF THE SPILLIMACHEEN RIVER BASIN

The Spillimacheen River Basin is 1430 km² in area and ranges in elevation from 900 m to 2700 m. From its headwaters adjacent to Glacier National Park, the Spillimacheen River flows southeast, descending 1800 m over its 80 km course to the confluence with the Columbia River. Bobbie Burns Creek, a major tributary to the Spillimacheen River, originates in glaciers near the southeastern portion of the basin and joins the Spillimacheen River upstream of Spillimacheen Dam.

The Spillimacheen River Basin has a typical southern interior climate with cold winters and hot summers. Heavy precipitation can occur during both winter and summer months, with winter precipitation consisting mainly of snow. Flow on the Spillimacheen River follows a typical snowmelt regime, with lowest flows occurring in winter and rising flows beginning in April or May. The annual peak inflow usually occurs in June or July as a result of snowmelt or rain falling on snow. Flow generally declines in August but can increase temporarily in response to rainstorms.

There is a Water Survey of Canada (WSC) gauge located on the Spillimacheen River downstream of the generating station (WSC 08NA011). Since the Spillimacheen project is a run-of-river facility with very little storage or regulation capability, and there are no significant tributaries between the dam and the WSC gauge the project inflow is essentially equal to project outflow (turbine discharge + spill) on a daily basis. Thus, direct use of the WSC data recorded downstream of the plant represents an accurate record of the daily inflows to the project.

The mean annual discharge of the Spillimacheen River (i.e. based on average daily inflows for all the data years on record) is about 35 m³/s. This average value has considerable natural variability in any given year. Based on the daily inflow records for the period 1951-1999, the maximum and minimum daily discharges on record are 311 m³/s and 2.0 m³/s, respectively.

4.0 OPERATING CONDITIONS FOR FACILITY

4.1 Role of Facility in BC Hydro’s System

The Spillimacheen project is part of BC Hydro’s integrated generation system which is described in “Making the Connection” published by BC Hydro in April 2000.

The Spillimacheen project generates on average a total of approximately 21 GWh of power on an annual basis. This is approximately 0.04 % of BC Hydro’s total annual generation.
4.2 Water Use at Spillimacheen Facilities

The Spillimacheen facility is a run-of-river plant. There is no significant volume of water stored in the headpond upstream of the dam – what flows in flows out. During non-freshet periods, the level of the headpond is kept relatively constant (within a 0.4 m range) and most of the inflow is diverted to the generating station. During the freshet, any changes in headpond level are primarily caused by fluctuations in inflow (rainfall and snowmelt runoff). Energy production at the generating station varies throughout the year as a function of river flows.

The Spillimacheen headpond is drawn down at the start of spring freshet to facilitate removal of flashboards from the spillway, a dam safety requirement. Spilling at the dam normally occurs from April to October. The flashboards are re-installed when river flows drop in the fall. The maximum diversion through the powerhouse for power generation is 8.25 m³/s compared to a mean annual river flow of 35 m³/s.

4.3 Emergencies and Dam Safety

Emergencies and dam safety requirements shall take precedence over the constraints outlined in this Water Use Plan. Emergencies include actual and potential loss of power to customers. Dam safety requirements for operations are outlined in the *Spillimacheen Dam: Operation, Maintenance and Surveillance Manual for Dam Safety (OMS SPN)* issued by BC Hydro’s Director of Dam Safety.

4.4 Conditions for the Operation of Works for Diversion and Storage of Water

The conditions outlined in this section are proposed for the operations of the Spillimacheen River project. It is recognized that BC Hydro may not be able to operate within these constraints during abnormal hydrological events.

4.4.1 Spillimacheen Dam

If inflow exceeds 0.85 m³/s, BC Hydro will provide a minimum flow of 0.85 m³/s year round downstream of the Spillimacheen Dam; normally via the undersluice gate. If inflow is less than 0.85 m³/s, BC Hydro shall release the available inflow.

4.4.2 Spillimacheen Generating Station

The ramping rate is for the ramping down of units when the total reduction in discharges from the powerhouse will reduce the river flow downstream of the generating station by more than 20%. In these situations, BC Hydro will ramp down the units at a maximum rate of 4.5 m³/s per hour to reduce the fluctuation in river flow below the generating station. A controlled flow reduction is not possible for forced outages.
5.0 PROGRAMS FOR ADDITIONAL INFORMATION

The Spillimacheen Consultative Committee did not recommend substantial changes to the present operation of the facility at this time. However, the Consultative Committee identified three areas of interest that require the collection of information for future decision making.

The operating recommendations of the Consultative Committee are contingent on the implementation of a monitoring program to reduce these uncertainties over time. Upon direction from the Comptroller of Water Rights, BC Hydro will undertake a monitoring program that will:

- Assess expected outcomes of the operational changes being recommended.
- Provide improved information for future operating decisions.

The main elements of the monitoring program are described below. Estimated annual costs for these studies and associated tasks are summarized in the Spillimacheen Water Use Plan: Consultative Committee Report.

- **Unit Rampdown Rates**: There is uncertainty regarding how full plant outages at the generating station affect river levels and thus fish and fish habitat downstream of the facility. This monitoring study will assess various rampdown rates (initially a 2-hour rate and up to a 5-hour rate) over a five-year period to determine the lowest threshold rate at which river stage change and impacts on fish can be effectively mitigated. This study would be done on an opportunistic basis during planned and unplanned plant outages at the Spillimacheen generating station. Additionally, the efficacy of reducing the headpond controller range to reduce spill discharge lag will be reviewed.

- **Monitoring of Habitat Maintenance Flows**: There is uncertainty whether flows of 0.85 m$^3$/s are adequate to prevent total freeze-up of pool habitat and maintain habitat connectivity within the canyon channel during sustained periods of cold weather. This would require the conduct of three field surveys over a five-year period. The result of this monitoring study may lead to a change in operations if the 0.85 m$^3$/s minimum flow is found to be inadequate as a winter habitat maintenance flow.

- **Assessment of Gravel Recruitment**: There is uncertainty regarding the recruitment of gravel through the timing of undersluice to the lower reaches of the river. This study would be conducted over a five year period and would provide information on gravel recruitment for future decision making.
6.0 IMPLEMENTATION OF RECOMMENDATIONS

The proposed conditions and monitoring program in this Water Use Plan will be implemented after BC Hydro receives direction from the Comptroller of Water Rights.

7.0 EXPECTED WATER MANAGEMENT IMPLICATIONS

Implications for the provincial interests considered during the preparation of this Water Use Plan are expected outcomes based on the best available information. After BC Hydro has been directed to implement the operational changes, BC Hydro will be responsible for meeting the operational parameters but not for achieving the expected outcomes.

7.1 Other Licensed Uses of Water

Apart from BC Hydro, there is only one other licence holder on the Spillimacheen River. The proposed conditions are not expected to affect current licence holder.

7.2 Riparian Rights

The proposed conditions are not expected to impact riparian rights associated with the headpond or along the river below the facility.

7.3 Fisheries

The proposed conditions (minimum flow, sluice operations, and ramp rate) are expected to ensure continued benefits to fish in the Spillimacheen River below the dam for improved overwintering habitat, spawning success, and reduced fish stranding risk.

7.4 Wildlife Habitat

The proposed conditions are not expected to significantly affect wildlife habitat or cause an impact on species at risk.

7.5 Flood Control

The proposed conditions are not expected to affect flood control in the Spillimacheen River.
7.6 Recreation

The proposed conditions are not expected to affect recreational activities, including hiking and fishing, on the Spillimacheen River. There are no formal agreements, restrictions or obligations for recreational purposes associated with the operation of Spillimacheen.

7.7 Water Quality

The proposed conditions are not expected to affect water quality in the Spillimacheen River.

7.8 Industrial Use of Water

There are no formal agreements, restrictions or obligations for residential, commercial and industrial purposes associated with the operation of Spillimacheen.

7.9 First Nation Considerations

The Spillimacheen project is in the asserted traditional use area of three First Nations: Ktunaxa people, Secwepemc people and Spallumcheen Indian Band. The proposed conditions are not expected to affect traditional use in the area.

7.10 Archaeological Considerations

The proposed conditions are not expected to affect archaeological interests.

7.11 Power Generation

The proposed operating conditions are expected to increase the unit cost of energy produced at the Spillimacheen project.

8.0 RECORDS AND REPORTS

8.1 Compliance Reporting

BC Hydro will submit data as required by the Comptroller of Water Rights to demonstrate compliance with the conditions conveyed in the Water Licence. The submission will include data for:

- Flow releases from Spillimacheen Dam, and
- Flow releases from Spillimacheen generating station.
8.2 Non-compliance Reporting

Non-compliance with any operation ordered by the Comptroller of Water Rights will be reported to the Comptroller in a timely manner.

8.3 Monitoring Program Reporting

Reporting procedures will be determined as part of the terms of reference for each study or undertaking.

9.0 PLAN REVIEW

A review of this Water Use Plan is recommended within 10 years of its implementation. A review may be triggered at Year 5 if significant new risks or opportunities are identified.

10.0 NOTIFICATION PROCEDURES

Notification procedures for floods and other emergency events are outlined in the “Aberfeldie, Elko and Spillimacheen Dams Emergency Planning Guide” and the “Power Supply Emergency Plan East Kootenay Generation (PSEP)”. Both these documents are filed with the Office of the Comptroller of Water Rights.