

EXECUTIVE SUMMARY

The Jordan River Water Use Plan consultative process was initiated in April 2000 and completed in November 2001. The consultative process follows the steps outlined in the 1996 provincial government *Water Use Plan Guidelines*. This report summarizes the consultative process and records the areas of agreement and disagreement arrived at by the Jordan Water Use Plan Consultative Committee. It is the basis for the draft Jordan River Water Use Plan simultaneously submitted by BC Hydro to the provincial government and the Comptroller of Water Rights. A Water Use Plan (WUP) is a technical document that, once reviewed by provincial and federal agencies and accepted by the provincial Comptroller of Water Rights, defines how water control facilities will be operated. The purpose of a water use planning process is to develop recommendations defining a preferred operating strategy using a public participatory process.

The Jordan River is located within the Capital Regional District, along the southwest coast of Vancouver Island, approximately 72 km from Victoria. The Jordan River hydroelectric project (JOR) is the only major facility on the southwest coast of the island and can contribute up to 35% of the total island hydroelectric generation. The hydroelectric system is comprised of three dams (Bear Creek, Jordan Diversion, and Elliott) and a single turbine powerhouse (170 MW maximum sustained generating capacity) which receives water through a 7.2 km tunnel and penstock from the Elliott Headpond. Bear Creek Dam and Jordan Diversion Dam impound Bear Creek Reservoir and Diversion Reservoir, respectively. Bear Creek Reservoir is not actively managed for power generation and free spills inflow like a natural lake. Diversion Reservoir provides the primary storage for the hydroelectric system and Elliott serves as the headpond for the powerhouse. No water is released past Elliott Dam into the Jordan River with the exception of seasonal spill events (1-2 times/yr).

Informal recreation occurs within the watershed, primarily in the reservoirs and on the coast. Resident fish (rainbow trout) are found throughout the reservoirs and the Jordan River. Prior to 1970, coho, pink, chum, and steelhead used the accessible portion of the lower Jordan River including the tailrace associated with the old powerhouse. Since the 1970's, however, no self-sustaining populations of salmon have been maintained in the river below the natural passage barriers. Industrial activities that may have contributed to their decline include altered flows due to hydroelectric generation, removal of estuary wetlands by forestry operations, and sediment and water quality issues associated with an abandoned copper mine site located in the lower part of the river. The Jordan River is in the traditional use area of the T'Sou-ke Nation, the Pacheedaht First Nation, and the Ditidaht First Nation.

The Jordan River Consultative Committee was comprised of fourteen members representing a variety of interests including: power, recreation, cultural use and heritage sites, fish, wildlife, water quality and socio-economic. The consultative process included numerous committee meetings to work through the steps outlined in the provincial *Water Use Plan Guidelines*.

The Committee explored issues and interests affected by the operations of BC Hydro's facilities and agreed to the following objectives for the Jordan River Water Use Plan:

- Maximize the value of power generation.
- Maintain recreational opportunities in the reservoirs.
- Maximize the quality of surfing.
- Maximize resident fish populations, invertebrates and aquatic life in the reservoirs.
- Maximize resident fish populations in the Jordan River below Elliott Dam.
- Maximize anadromous fish populations in the Jordan River below Elliott Dam.
- Optimize littoral habitat in reservoirs and riparian habitat along streams for wildlife.
- Increase socio-economic welfare of the local community.

Performance measures were identified based on these objectives. Where possible, performance measures were modelled quantitatively. In other cases, they were described qualitatively. Operating alternatives were then generated to meet the various objectives. In total, fifteen alternatives were run through BC Hydro's operations model and then assessed based on the performance measures.

To assess the alternatives and develop an accepted operating strategy for the system, the following components of the Jordan River Project were examined individually: Bear Creek Reservoir, Diversion Reservoir, Elliott Headpond, flows downstream of Elliott Dam, and turbine discharge. The preferred options for the various components were then combined to form a complete operating strategy.

The majority of committee members, with the exception of two members representing the T'Sou-ke Nation, came to agreement on one operating alternative. The recommended alternative and the operating constraints are outlined in Table 1:

Table 1 Recommended Operating Constraints for the Jordan River Hydroelectric System

System Component	Constraint	Time of Year	Purpose
Bear Creek Reservoir	BC Hydro shall not operate the low level outlet in a manner which drafts the elevation below 411 m, except in emergency situations. ¹	All year	Reservoir productivity; recreation
Diversion Reservoir	Minimum normal elevation of 376 m.	1 Jul-30 Sept	Reservoir productivity and reduced fish stress
	Minimum normal elevation of 372 m.	1 Oct-30 Jun	
	BC Hydro shall not operate the reservoir below the stated minimum elevations except in emergency situations, ¹ when undertaking works associated with maintaining the integrity of the dam for dam safety reasons or in low water situations to provide flows downstream. In low water situations, when the reservoir elevation is expected to drop below the normal minimum operating level, BC Hydro shall notify the appropriate federal and provincial agencies. BC Hydro will then proceed with providing a 0.25 m ³ /s flow below the Elliott Dam during the 4-year river monitoring program, or reduce flows and reservoir levels according to a flow decision rule ² when the monitoring program is not in place.		
Elliott Headpond Elevations	No operating constraints. BC Hydro shall seek opportunities to reduce the fluctuation of the headpond levels by further coordinating planned releases from Diversion Reservoir and the operations of the penstock intake.	All year	Reservoir productivity
Elliott Dam Outlet (new infrastructure needed)	Base target flow of at least 0.25 m ³ /s with an accepted deviation to 0.225 m ³ /s. In low water situations, this flow may need to be reduced (see Diversion Reservoir Section).	All year	River ecosystem health
Turbine Discharge	BC Hydro shall plan to operate the generation with a discharge of not greater than 30 m ³ /s from 6:00 a.m. to 6:00 p.m. on a minimum of 4 weekend days during the month of March. Higher releases are permissible when required to manage basin inflow, or emergency situations. ¹ A surfing representative may advise BC Hydro of a good weekend day in March and BC Hydro shall make reasonable attempts to apply this constraint on that day.	Up to four weekend days in March	Recreational surfing

¹ Emergency: Emergencies include those required to address dam safety, actual or potential loss of power supply to customers, dam breach or potential dam breach, extreme flood flows, fire or explosion, environmental incidents, major equipment failure, or threat to employee or public safety. Notification will occur as outlined in emergency procedures.

² See Appendix N for proposed decision rule.

In order to implement the operating recommendations stated above, new infrastructure is required to provide a base flow below Elliott Dam. The estimated cost of the new infrastructure was included in the trade-off discussions of the relevant alternatives.

All committee members, with the exception of two representatives from the T'Sou-ke Nation, came to agreement on the final operating recommendations. The level of support for the recommendations varied, particularly with respect to the provision of flows below Elliott Dam. Preferences were documented and additional member statements of values are included in this report. The T'Sou-ke Nation representatives supported the Run-of-River alternative as they felt it is the closest to restoring river flows and the conditions interpreted as the basis for exercising their fish dependent treaty rights.

The expected outcomes of the final recommendation are summarized in Table 2. Once the Water Use Plan is approved by the Comptroller of Water Rights, BC Hydro will be responsible for meeting the operating parameters set out in the Water Use Plan. The outcomes listed in Table 2 are expected to occur as a result of implementing operational changes. BC Hydro will not be responsible for achieving these outcomes.

Table 2: Expected Outcomes of Recommended Operations

Interest	Expected Outcomes
Resident Fish/Recreation (Bear Creek Reservoir)	Maintain as a natural lake (i.e. free spill reservoir): optimum conditions for fish and recreation.
Resident Fish/Biological Productivity (Diversion Reservoir)	Reduce fish stress. Maintaining a higher level is expected to provide better temperature and oxygen conditions.
Resident Fish/Biological Productivity (Jordan River Downstream of Elliott Dam)	Provide an additional (approximately 15 times) amount of rainbow trout rearing habitat expressed as weighted useable area (from 224 to 3163 m ²) in August, the period of expected lowest local inflows. Year round flow is estimated to provide an additional three kilometres of continuously wetted river habitat in the upper reaches all year. A year round base flow provides constant protection (up to 0.25 m ³ /s) for the entire lower Jordan River during summer low flows and winter freeze ups, which will benefit resident fish and overall ecosystem health. Although the decision is based on improvements to resident (rainbow trout) populations and riparian productivity, it is recognized there may be ancillary benefits to anadromous species by providing better conditions for their re-establishment in the lower 500 m of the Jordan River.
Power ¹	Costs of \$430,000/yr (comprised of forgone power of \$330,000/yr and total estimated costs of new infrastructure of \$1,000,000 amortized over 20 years for an annual cost of \$100,000/yr).
Recreation: Surfing	Enhance quality of surfing by providing a minimum of 4 weekend days in March with minimal disruption from turbine discharge.

1. The total power cost estimate was revised to \$483,000/yr based on refined modelling to capture the value of reservoir storage and plant dispatchability. The revised estimate for forgone power is \$383,000/yr (or an additional \$53,000/yr). Estimates for new infrastructure remain the same.

Sources of uncertainty associated with each expected outcome were discussed by the Consultative Committee.

Key uncertainties will be addressed through the recommended monitoring program. The components of the monitoring program include:

- Validation of local inflow measurements (River): Determines whether inflow data for river below Elliott Dam was accurately estimated from drainage area calculations. This will confirm whether or not a 0.25 m³/s base flow release will significantly enhance habitat.
- Biological productivity as characterized by fish (River): Demonstrates whether a base flow elicits a response in resident fish condition and abundance.
- Qualitative habitat survey for anadromous salmonids (River): Observes whether a base flow elicits any ancillary responses in anadromous fish rearing and spawning success in the lower Jordan River.
- Biological productivity as characterized by fish (Reservoir): Confirms that the restrictions in reservoir drawdown levels improves conditions for resident fish.
- Surfing monitoring (Estuary): Addresses the extent of additional surfing benefits associated with generation restrictions on weekend days during March.

The annual costs of the recommended package and monitoring plan, including development of detailed terms of references and review of monitoring results, are outlined in Table 3.

Table 3 Annual Cost of Operational Changes and Monitoring Program

Cost Components	\$ Cost '000/Year							
	1	2	3	4	5	6	7	8
Foregone Power	-	-	330	330	330	330	330	330
New Infrastructure								
• Engineering design	100							
• Infrastructure cost		100	100	100	100	100	100	100
Monitoring Program								
• Develop terms of reference	40							
Recreation								
• Surfing Quality	1	0.5	0.5	0.5	0.5	0.5		
River Fish Monitoring Studies								
• Inflow measurements		6	6	6	6	6		
• Biological productivity (fish)	20	20	20	20	20	20		
• Habitat quality			10	10	10	10		
Reservoir Fish Monitoring Studies								
• Biological productivity (fish)		10	10	10	20			
Review Monitoring Results						35		
TOTAL³	161	137	477	477	487	537	430	430

1. The revised estimated cost for forgone power in years 3 to 8 are \$383,000/yr (or an additional \$53,000/yr) based on refined modelling to capture the value of reservoir storage and plant dispatchability.
2. The numbers reflected in this table are the total costs which the Consultative Committee based their trade-off discussions. The Committee agreed to have the revised estimates reflected as notes to this table. The revised total cost estimates for years 3 to 8 should be revised to capture the additional \$53,000/yr explained above. Revisions are as follows: Year 3 = \$530,000; Year 4 = \$530,000; Year 5 = \$540,000; Year 6 = \$590,000; and Years 7 and 8 = \$483,000.
3. Totals have been rounded to the nearest thousand.
4. Years 1 through 8, in thousands of dollars. Year 6 marks a review of the monitoring program results.

The Consultative Committee did not establish a review period for this Jordan River Water Use Plan. However, the Committee did make the following recommendations for the implementation period:

- Remediation of the mine site in the lower Jordan River will trigger a review of the Water Use Plan.
- A review of the monitoring results will occur after 6 years.
- The review of monitoring results may trigger a review of the Water Use Plan.

In summary, the Jordan River Water Use Plan Consultative Committee members, with the exception of the T'Sou-ke Nation representatives, came to agreement on a recommended operating alternative and associated monitoring program to be submitted by BC Hydro to the Comptroller of Water Rights.

The consultative process provided a forum to share information and promote understanding of various affected interests, perspectives and values, explore alternative ways to operate the facility, and evaluate outcomes of operational changes in a structured way. This facilitated an open and transparent decision-making process. This participatory form of recommendation making provides accountability and an assessment of current public values to make more informed water management decisions in the province.