EXECUTIVE SUMMARY

Water Use Planning was announced in 1996 to ensure provincial water management decisions reflect changing public values and environmental priorities. A Water Use Plan (WUP) is a technical document that, once 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.

Background

The Shuswap River hydroelectric facilities are located on the upper reaches of the Shuswap River, about 35 km east of Vernon and the Okanagan Valley. The hydroelectric system is linear, comprising a single dam (Sugar Lake Dam) impounding a reservoir (Sugar Lake Reservoir) and a smaller dam (Wilsey Dam) creating a headpond for a two-unit generating station, further downstream.

Issues

The Shuswap River hydroelectric system is relatively small from a power perspective, contributing about 37 GWh annually to total provincial generation, about enough energy to provide the annual needs of 4000 homes. However, the river system carries a large importance for fish, playing a role in the lifestages of chinook, coho, kokanee and many other species. By retaining some of the freshet and releasing it gradually over the remainder of the year until the following spring, the reservoir serves both to increase power production and to enhance spawning and incubation flows downstream of the facilities. Since power generation was constant over a wide variety of alternatives, the challenge for the Consultative Committee was to find an operating alternative that maximized what was best for these fish downstream of the powerplant during the fall and winter periods when flows could be augmented.

The impact of reservoir operations on recreation also played a role in discussions as the reservoir is valued for boating, camping, and fishing opportunities. The Consultative Committee (CC) ensured that impacts to these values were tracked when selecting among alternatives.

The influence of reservoir operations on erosion around the reservoir was also considered in discussions. The existence of private property and First Nations archaeological sites that are subject to erosion turned out to play a large role in decisions made among alternatives by the Consultative Committee.

The operation of the Sugar Lake Dam was the focus of those who are affected by flooding along the Shuswap River. A strong interest was expressed in finding ways to enhance flood control, both through the operations of the current facility and through physical changes to these facilities.

Finally, the impact of unplanned flow disruptions arising from outages at the generating station was a key issue for the Consultative Committee. Sudden changes in flows have the potential to harm fish downstream, their impacts are difficult to observe and to quantify, and the ability to address these impacts through operational changes is limited.

The Consultative Process

The Shuswap River Consultative Committee consisted of 20 members representing a variety of interests including: power generation, recreation, cultural use and heritage sites, fish, wildlife, and flooding. Consultative Committee members represented various levels of governments, a First Nation, local interest groups and private landowners. The consultative process began in March 2000 and concluded in April 2002. Sixteen committee meetings were held during this period to work through the steps outlined in the provincial government's *Water Use Plan Guidelines.*

Objectives and Performance Measures

The Shuswap River Water Use Plan Consultative Committee explored issues and interests affected by facility operations and agreed to the following objectives:

- Maximize the net value of power generated;
- Maintain dam safety through all operations;
- Minimize flooding and erosion to property around the reservoir and on the river;
- Maximize recreational opportunities around the reservoir and on the river;
- Maximize the protection of archaeological resources around the reservoir;
- Maximize opportunities for First Nations' access to archaeological sites around the reservoir;
- Maximize wildlife habitat around the reservoir and on the river;
- Maximize habitat conditions in the reservoirs to maximize resident fish populations;
- Maximize spawning and rearing success for fish in the river; and
- Minimize the impacts of unplanned outages on all the lifestages of fish below Wilsey Dam.

Performance measures were developed based on these objectives. Where possible, performance measures were modelled quantitatively. In other cases, impacts were described qualitatively for different alternatives.

Creating Alternatives

Operating alternatives were developed to meet various objectives. In total, 24 alternatives for Sugar Lake Dam operations were run through BC Hydro's operations model which is based on historic natural inflows and then assessed based on their impacts on the objectives. In addition, three alternative ways of routing water at Wilsey Dam were considered, as well as a physical change to the facility in lieu of these operational changes. To assess the alternatives and develop an accepted operating strategy for the system, the operations at Sugar Lake Dam were considered independently from those at Wilsey Dam. The results were then combined into a single package at the end of the process.

Lessons Learned Around Physical Impacts of Sugar Lake Dam Releases

A number of key conclusions arose once the impacts of the numerous alternatives were analyzed, highlighting the understanding that can arise from a structured approach to decision-making. Power generation was relatively unaffected across a wide range of alternatives pursued, making it irrelevant to the trade-off analysis. As well, given the existing dam structures, the ability to control floods downstream was unchanged across these alternatives, and maximized under what was referred to as the Status Quo operations.

Several important facts were learned when analyzing the effects on fish. The first was that there was no apparent trade-off among species; one alternative maximized fish performance measures across all species. Secondly, there was no trade-off between fish in the reservoir and fish in the river. Finally, the Status Quo alternative represented the most favourable one for fish in the river. None of this was obviously apparent at the beginning of this process.

For impacts on archaeological sites around the reservoir, the data showed there was a fundamental conflict for most alternatives between protecting archaeological sites against erosion and keeping them covered to protect them from unauthorized collection.

Finally, the analysis of the impact of the alternatives on the recreation and reservoir erosion performance measures showed that the Status Quo operations could be improved upon through minor changes in reservoir elevations during the summer.

Lessons Learned Around Committee Members' Values Regarding Operational Impacts of Sugar Lake Dam

In their final choice, Consultative Committee members faced two options: Alternative A2 which was better for paddle sports on the river, erosion around the reservoir, and the protection of archaeological sites around the reservoir, or Status Quo which provided a small advantage to fish in the river. In choosing the Status Quo over Alternative A2, Consultative Committee members showed the high value they placed on the fish resources in the Shuswap River and their risk averse approach to managing this resource.

Lessons Learned Around Physical Impacts of Routing Water at Wilsey Dam

Since the impacts of unplanned flow disruptions on fish in their various lifestages are very difficult to quantify, the performance measures used in measuring these impacts were qualitative in nature only, and subject to a wide level of interpretation amongst the Fish Technical Committee (FTC). Nevertheless, it was made clear that continuously re-routing water away from the generators and into the spillway to reduce the impact of unplanned flow reductions is a more expensive and less effective way to address these issues than through the use of a gated spillway. A gated spillway, if feasible, would represent the best available control technology to mitigate against downstream flow disruptions.

Lessons Learned Around Consultative Committee Members' Values Regarding Operational Changes and Capital Works at Wilsey Dam

Committee members showed a wide divergence in their willingness to forego provincial power revenues or invest provincial money to reduce the impact of unplanned flow disruptions below Wilsey Dam. Many were risk adverse in their approach to protect fish stocks from unquantified and infrequent negative impacts of unplanned flow disruptions. Others did not want to commit provincial funds towards a project with unquantified benefits and infrequent impacts.

On a process note, those Consultative Committee members impacted by flooding along the river expressed a great deal of frustration that changes to the Sugar Lake Dam to increase flood control (such as making it larger or constructing additional gates) were outside of the scope of water use planning and were not investigated by this process.

Recommendations for Operations at Sugar Lake Dam

The committee members agreed by consensus to recommend the operating alternative designated as Status Quo for Sugar Lake Dam. This operation was viewed as the best alternative by many of the Consultative Committee members, and was accepted with minor reservations by others. The general operating parameters for this alternative are stated below.

- Latter Part of Summer - fill the reservoir after freshet and maintain a minimum of 601.22 m throughout August and a minimum of 600.50 m during September;
- Fall and Early Winter - release stored water gradually over the fall months to conserve storage for winter flows. In dry years, maintain flows of at least 16 m^3/s below Wilsey Dam from 15 August to 31 December;
- Winter to Freshet - release stored water gradually so that the reservoir is not empty before 28 February, but empty by 1 April. In dry years, maintain flows of at least 13 m^3/s below Wilsey Dam from 1 January until 1 April;

- Freshet to late summer - maximize storage capacity of the reservoir by keeping gates open until freshet has passed and then follow the staged stoplog installation protocol set by Dam Safety to fill the reservoir by the end of the summer; and

- All year round - follow prescribed ramping rates.

Recommendations for Operations at Wilsey Dam

The Consultative Committee was unanimous in not supporting any alternative that diverted water from the generators to the spillway as a means for protecting fish downstream from sudden flow disruptions. Some of the Consultative Committee would have accepted such an alternative with reservations while others would have found this unacceptable.

However, there was no agreement as to whether a gated spillway should be installed as a means of protecting fish downstream from unexpected outages. Most of the Consultative Committee, including BC Hydro, accepted or supported such an alternative. However, one member of the Consultative Committee felt that this was unacceptable. Consequently, there was no consensus recommendation around operations at Wilsey Dam.

Recommendations for Monitoring

The Consultative Committee expressed a wide range of opinions around which outstanding issues would require monitoring. A large number of studies were considered, both within the sub-groups and around the Consultative Committee table. There was agreement that a number of these studies were of a low enough priority that they were not required. In addition, there was no agreement amongst the Consultative Committee on the support for some studies, however, they did reach consensus on three monitoring studies:

- Local Inflow Measurement for Sugar Lake Reservoir

  Uncertainty being addressed: whether inflow data for the reservoir has been accurately measured, and whether additional, real time information can add to operational flexibility in the spring.
  Cost: $7,000 per year.

- Estimation of the Extent of Future Erosion Around the Reservoir

  Uncertainty being addressed: whether the reservoir is close to achieving bank stability, or whether operations at full pool will continue to erode the shoreline around the reservoir causing extensive damage over time.
  Cost: $15,000 for a one time study.

- Local Stage Measurement for Shuswap River below Wilsey Dam

  Uncertainty being addressed: whether the performance measure for flooding accurately captures the point at which flooding starts downstream of Wilsey, and what the link is between these flows and the extent of flooding over farmers fields.
  Cost: $20,000 for installation of a data collection platform, and administrative costs of $1,000 to collate data.

Costs of Monitoring

The total cost of this monitoring package is $36,000 in one time expenses, and $7,000 per year.

There were also a number of studies focussed on fish interests that were supported by most of the Consultative Committee, including BC Hydro, but that were viewed as an unacceptable use of money by others around the table.

Review Period

The Consultative Committee recommended BC Hydro report monitoring information on an annual basis, and that an informal review of the monitoring data be conducted 5 years after the Water Use Plan is implemented. If the information reviewed at that time warrants, a request can be made to the Comptroller of Water Rights for a formal review of the Water Use Plan. In absence of this, the Consultative Committee agreed that a formal review of this Water Use Plan should be conducted 10 years after the Water Use Plan is implemented.

Conclusion

In summary, the majority of the Shuswap River Water Use Plan Consultative Committee members agreed on a recommended operating strategy for the Sugar Lake Dam, and elements of a recommended monitoring program for Sugar Lake Reservoir and the Shuswap River. However, there was no consensus on several additional elements of the monitoring program, nor was there consensus on operational changes or physical works at Wilsey Dam to mitigate against outage events.

The consultative process provided a forum to share information and promote understanding of various interests and perspectives, explore alternative ways to operate the facility, evaluate impacts in a structured way and thus make choices more explicit. This participatory form of 'decision-making' provides accountability and an assessment of current public values to make more informed water management decisions in the province.