11 Preferred Strategy and Comparison with Current Operation

The preferred strategy was developed as an iterative process in which successive changes were made to the present operating plan to address identified concerns in each lake or river reach. As noted in Section 9, the initial strategy was to adjust rule curves to address biological or social concerns documented for each lake or river reach, and then utilize the ARSP model to evaluate the magnitude of the resultant changes (in terms of seasonal lake levels and river flows), the cumulative effect (if any) of the changes, the effect on hydropower generation potential, and the potential applicability of the overall strategy on a watershed scale perspective. Specific concerns identified during the Case One evaluation were then addressed by further revisions to the rule curves, and additional model runs (often more than one) to determine whether the proposed revision met the project objectives (watershed wide and lake/reach specific objectives).

These refinements lead to the development of a strategy for each lake/river that met the specific lake or reach objectives. This overall strategy was then subjected to a detailed analysis to evaluate its conformity with project objectives and its applicability on a river-system scale perspective. The analysis utilized the 22 evaluation criteria identified in Section10, and compared the proposed strategy (Case Two) with the current operating plans (Base Case). The results of that detailed analysis are presented in Appendix F (Tables F1.1 to F1.5) and summarized in Tables 11.1 and 11.2.

The lake-by-lake comparison (Table 11.1) indicates that the Case Two option resulted in 31 positives ratings, 127 neutral, and 18 negative ratings in the North Branch subwatershed. Slightly more positive ratings (on a comparative basis) were obtained for natural environment attributes than social attributes. In the South Branch subwatershed, there were 61 positive ratings, 92 neutral and 19 negative ratings. Natural and socioeconomic attributes were fairly evenly balanced. In the lower subwatershed, there were 21 positive ratings, 43 neutral and 5 negative ratings, with improvements in natural and socioeconomic attributes evenly balanced.

Table 11.1
Summary of Case Two Criteria Attribute Ratings*

Lake	Natural Attributes			Socioeconomic Attributes			Total		
	+ve	neutral	-ve	+ve	neutral	-ve	+ve	neutral	-ve
North Branch									
McCraney Lake	0	5	1	6	6	1	6	11	2
Camp Lake	2	3	1	8	7	0	10	10	1
Tasso Lake	1	4	1	3	10	2	4	14	3
Buck Lake	1	4	0	0	12	1	1	16	1
Fox Lake	1	4	0	0	12	1	1	16	1
Distress Dam	1	1	0	1	5	2	2	6	2
Huntsville Lakes	1	4	1	0	12	3	1	16	4
Mary Lake	2	3	1	1	11	3	3	14	4
Wilson Falls	0	2	0	1	6	0	1	8	0
High Falls	0	2	0	1	6	0	1	8	0
Bracebridge Falls	0	2	0	1	6	0	1	8	0
Subtotal	***9***	***34***	***5***	***22***	***93***	***13***	***31***	***127***	***18***
South Branch									
Burnt Island Lake	1	3	2	7	6	0	8	9	2
Joe Lake	1	4	1	4	5	4	5	9	5
Ragged Lake	2	3	1	7	5	1	9	8	2
Canoe, Tea, Smoke Lakes	2	3	1	3	9	1	5	12	2
Kawagama Lake	3	3	0	4	10	1	7	13	1
Lake of Bays	3	3	0	4	10	1	7	13	1
Wood Lake	0	5	0	3	10	0	3	15	0
Matthias Falls	1	1	0	4	2	1	5	3	1
Trethewey Falls	1	1	0	3	3	1	4	4	1
Hanna Chute	1	1	0	3	2	2	4	3	2
South Falls	1	1	0	3	2	2	4	3	2
Subtotal	***16***	***28***	***5***	***45***	***64***	***14***	***61***	***92***	***19***
Lower Subwatershed									
Lakes Rosseau and Joseph	4	2	0	6	8	1	10	10	1
Lake Muskoka	1	5	0	1	14	0	2	19	0
Burgess	0	2	0	3	4	0	3	6	0
Ragged Rapids	0	2	0	3	2	2	3	4	2
Big Eddy	0	2	0	3	2	2	3	4	2
Subtotal	***5***	***13***	***0***	***16***	***30***	***5***	***21***	***43***	***5***
Watershed Total	***30***	***75***	***10***	***83***	***187***	***32***	***113***	***262***	***42***

* Raw data used to summarize the attributes noted herein, are contained within the Options Report (Acres, February 2004).

Table 11.2
Case Two Attribute Rating Comparison*

Attribute Criteria	Rating		
	+ve	neutral	-ve
Natural Environment/Aquatic Ecology Attributes			
Fall/Winter Water Levels for Lake Trout Habitat			
Outcome	5	5	3
Spring Water Levels for Wetlands/Fisheries			
Elevation of spring peak	6	10	0
Timing of spring peak	3	9	4
Water level change in 30 days	0	16	0
Summer Baseflow for Ecosystem Health			
7Q2	6	20	1
7Q10	10	15	2
Subtotal	***30***	***75***	***10***
Social Environment Attributes			
Spring Water Level and Flow Management			
Maximum daily spring lake level	0	14	2
Number of high water zone exceedances	2	14	0
Ice damage potential	0	14	2
Maximum daily river reach flow	1	16	0
Number of exceedances of DOM flow limit	0	15	2
Summer Recreation Season Water Levels			
Mean daily level	4	9	3
80^{th} percentile daily level	5	10	1
Summer Recreation Season Water Levels Infrastructure Comparison			
Minimum distance	0	8	0
Maximum distance	1	7	0
Summer Recreation Season River Flows			
Minimum daily flow (7 day)	17	10	0
Number of flow fluctuations	9	16	2
Domestic/Municipal Usage			
Median Weekly flow - Summer	6	7	4
- Winter	6	7	4
Minimum weekly flow - Summer	11	6	0
- Winter	5	9	3
Subtotal	**67**	**162**	**23**
Economic Environment Attributes			
Flow Available for Power Generation			
Quarterly	14	17	9
Annual	2	8	0
Subtotal	***16***	***25***	***9***
Summary			
Natural Environment	30	75	10
Social Environment	68	160	24
Economic Environment	16	25	9
Total Number/Percent	***113 / 27%***	***262 / 63%***	***42 / 10%***

* Raw data used to summarize the attributes noted herein, are contained within the Options Report (Acres, February 2004).

In the comparison by attributes (Table 11.2), the Case Two option was assessed as providing improvements for the natural environment in 30 instances, remained unchanged 75 times and provided less favourable conditions 10 times. For the social attributes evaluated, the Case Two option provided 67 positive ratings, compared to 162 neutral ratings and 23 negative ones. For power generation, the Case Two option provided 16 positive ratings, 25 neutral and 9 negative ratings. Overall, throughout the river system, 63% of the attributes examined remained unchanged, while 27% showed an improvement, and 10% exhibited less favourable conditions. The analysis indicated that there would not be a major change in the river system characteristics with the adoption of the Case Two option, but that there would be a modest improvement over the current situation. The strategy adopted at the beginning of the planning process of generally restricting water level adjustments to within the present NOZ (particularly for those large lakes with extensive built infrastructure) has limited the amount of change that could occur.

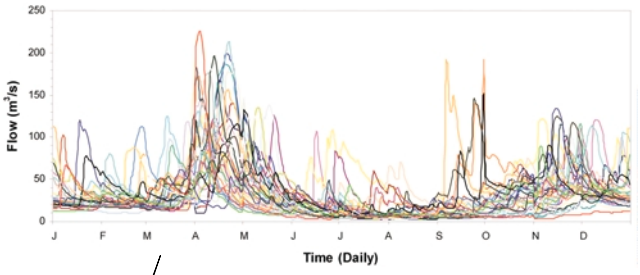
11.1 Overview of the Preferred Strategy

In developing the preferred strategy, close attention was paid to flows within individual river reaches (and specific flow constraints within those reaches), and the development of operational strategies that would respond to documented concerns throughout the entire river system (lakes and river reaches). The main concerns expressed for river reaches were the day-to-day variability of river flows and the maintenance of a minimum flow. In lakes, the main concerns were related to the improvement of ecological conditions (lake trout spawning habitat, spring spawning fish habitat, riparian zone and wetland habitat) and the maintenance or improvement of social values and water power potential. In some cases, the proposed operating regime formalized hydrologic features (i.e., earlier and/or higher spring water levels) that were not well captured by the current operating plans. Generally, the overall goal of the new strategy was to enhance natural environment features, while remaining within the current operating zone limits, so as to maintain water power, recreational and navigational needs. These features are shown in a generic fashion in Figure 11.1, while they are presented in detail for the various river system lakes, reservoirs and river reaches in the following sections.

- The Preferred Strategy for the operation of the 28 dams that control water levels and flows within the Muskoka River system responds to a number of common issues and concerns
- For each lake or downstream river reach, specific issues/considerations were then integrated into the preferred strategy
- The overall strategy applied to the majority of the lakes/river reaches is illustrated in a general fashion in the graphic below

Sloped Target Operating Level

- help maintain river base flow during normal hydrologic conditions
- consider 'natural flow regime' in developing new operating strategy

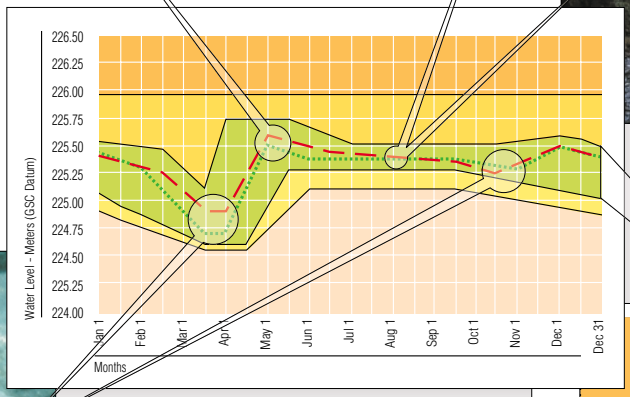




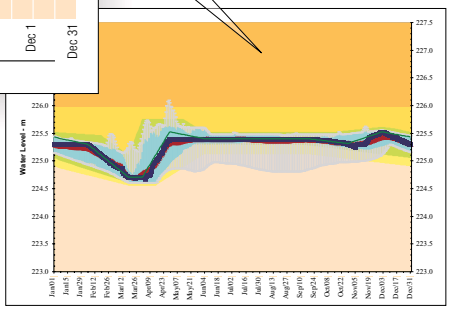


Higher Spring Water Levels

- recharge groundwater supplies
- inundate wetlands and shoreline vegetation and transfer flood water nutrients/sediment to these areas
- provide access to spawning grounds for spring spawning fish species







ARSP Simulation Base Case
- Operating Rules and Daily Water Level Statistics

- lake trout fry (yolk sac larva) are immobile after hatch, and remain in the gravel until late April/early May until they emerge and disperse
- less differential between fall and winter water levels will reduce the risk of lake trout fry being dewatered by the winter drawdown

- proposed operating level remains within the Normal Operating Zone (NOZ) to maintain waterpower recreational and navigational needs
- ARSP modelling confirms that levels will remain within the NOZ during most conditions

Figure 11.1
Muskoka River Water Management Plan
Preferred Strategy

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Back of figure

The preferred strategy will target high spring water levels with a gradual release throughout the spring and summer season. High spring levels help to recharge groundwater supplies, transfer nutrients and sediments to wetlands and shoreline riparian zones, and provide access for spring spawning fish and amphibians to wetland and shoreline riparian zone spawning habitats.

The slow, gradual decline allows nutrients and sediments to settle out within wetlands and shoreline riparian zones, ensures that floodwaters are absorbed into shoreline soils and wetland areas, thereby recharging groundwater supplies, and allows the progeny of spring spawning fish and amphibians that utilize these shoreline areas to return to the main water body (lake or river reach). However, the need to restrict spring water levels to protect established infrastructure often limited the ability to increase spring water level beyond the existing level on developed lakes. Hence, this objective was most applicable to lakes that have no or limited infrastructure.

During the summer season, the preferred strategy will utilize the available storage within the NOZ zone on the large lakes to modulate the discharge from the dams, so as to minimize changes in river flow and provide a minimum flow in the stream reaches under normal operating conditions. This is expected to result in more frequent lake level fluctuation than with the Base Case, but these level changes would occur gradually, and would be significantly less than the average fluctuations in river water levels. This strategy also provides slightly higher and more consistent flows for hydropower during the summer season, which will offset the lower flows over the winter period.

The preferred strategy also proposes to improve lake trout habitat conditions, while maintaining the shoreline infrastructure protection that results from the winter drawdown. Presently, many of the large lakes are lowered over the winter to increase their capacity to store the spring freshet, and so maintain spring water levels at a reasonable level (to avoid infrastructure damage). This process also benefits waterpower producers, as the water that is released from the lakes during the winter is routed through downstream waterpower facilities for hydropower production. However, advances in the understanding of lake trout biology since the development of the previous operating strategy indicate that lake trout eggs and/or fry are likely being dewatered (within shoreline spawning shoals) when winter drawdown levels are more than 20 cm below the fall drawdown level. Therefore, the preferred strategy has attempted to reduce this differential, while

ensuring that the proposed change does not negatively affect a lake's ability to store a sufficient portion of the spring freshet to maintain protection of shoreline infrastructure. Reduced over-winter flows for waterpower production will be compensated by higher summer flows.

A preliminary version of the preferred strategy was presented to the public for review and comment in October 2003, and was subsequently documented in the *Options Report Muskoka River Water Management Plan* (Acres, 2004a). Since then, comments have been received from various stakeholder groups, and new operating zones have been established for waterpower facilities on the system. In accordance with water management planning guidelines, single operating zones have been developed for the waterpower facilities, which will replace the multiple zone operating plans presently under use. The new zones establish clearly defined, enforceable operating zones (i.e., 'compliance' zones) for those facilities, yet include provisions to address season and/or unusual flow events.

In the following pages, the proposed plan for each lake/reservoir and waterpower facility within the river system is compared to the existing operational plan. Operating limits, TOL and/or BMP for various structure and/or seasons are presented.

The TOL will be used to guide dam operations. When compared to actual lake level, it provides an indication to MNR operators whether dam adjustments are required to stay within the NOZ. While the line denotes a "target" operating level, it is recognized that water levels will fluctuate within the NOZ in response to typical changes in seasonal and annual rainfall, snow melt and associated runoff. Lake levels may also go outside the NOZ during extreme events (flood or drought – see accompanying figures for lake-specific information).

BMP provide similar guidance pertaining to 'preferred' water levels within waterpower facility head ponds. The term "Best Management Practice" shall be defined as a guideline for operation during favourable conditions and shall be applied solely at the discretion of the dam owner/operator. Operating away from the "BMP" guideline shall not be deemed to constitute an 'out of compliance' incident within this WMP, and shall not be considered a reportable occurrence. 'Favourable conditions' are further defined as operational, hydrological and/or environmental.

High and low flow situations are addressed in Section 13.3 (for waterpower facilities) through the identification of High Flow Triggers which represents the discharge above which downstream flooding will occur and Low Flow Triggers which represent flows below which facilities may have difficulty maintaining water levels due to leakage, infiltration and evaporation.

Criteria that were of importance for decision-making for a particular lake, reservoir, river reach or waterpower facility are provided in the 'Comments' column. Changes resulting from stakeholder discussions have been incorporated (as applicable). River flow (in the reach below the dam) resulting from the proposed lake/reservoir operating strategy is generally provided with the respective lake, but may be provided under a separate heading if deemed appropriate. Flow values are predicted by the ARSP model using 50 years of simulated data. Watershed lakes and waterpower facilities are presented sequentially, commencing at the upstream limit of each subwatershed and proceeding downstream, beginning at the North Branch subwatershed, then the South Branch, and finally, the lower sub-watershed. A detailed presentation of individual operating plans, and the manner in which they respond to identified issues and concerns, is provided in Section 12.

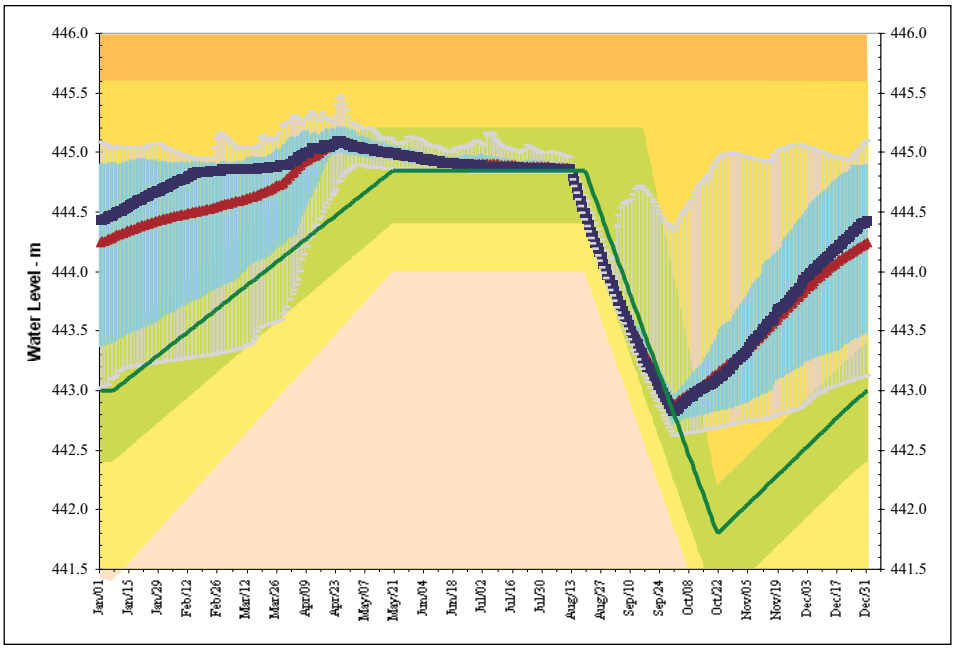
11.2 North Branch Muskoka River

11.2.1 McCraney Lake

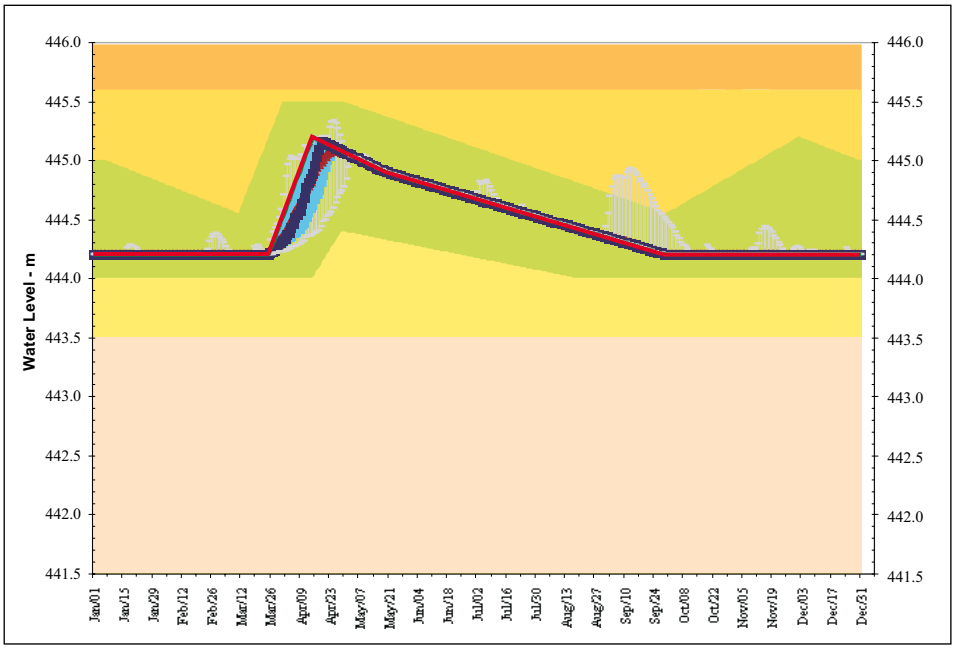
The proposed plan is compared to the existing operating plan in Table 11.2.1 and Figure11.2.1. Proposed changes for this lake are significant, and require the development of a new NOZ to accommodate the TOL revisions. Fewer operations of the dam will be required to achieve the desired flows and water levels, and the dam could be set to function as, or be converted to, a self-regulating structure.

Table 11.2.1 McCraney Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	445.2 444.0 444.85 Apr 21 0 -	445.5 – 445.3 444.4 – 444.3 445.2 – 444.85 Apr 20 0.35 Down	More natural water level regime with higher spring peak and gradual spring/summer drawdown from May 1 to Sept 30. Less change in summer levels will improve summer recreational potential and ecological conditions.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	445.2 444.0 – 442.8 444.85 – 443.33 1.52 Down	445.3 – 444.55 444.3 – 444.0 444.85 – 444.3 0.65 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	445.2 – 442.2 442.8 – 441.2 443.33 – 441.8 1.53 Down to Oct 15, then natural rise.	444.55 – 445.2 444.0 444.3 – 444.2 0 Down to Oct 15, then natural rise.	Stable fall water levels should improve lake trout habitat in long term
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	442.92 – 444.53 441.92 – 443.51 442.52 – 444.03 1.51 Rise	445.2 – 444.6 444.0 444.2 0 No induced change	Stable winter water level will eliminate freezing of littoral zone sediments and associated ice damage.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release & timing Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	2-3 m^3/s, Aug 15 to Oct 15 0.76 m^3/s 0.01 m^3/s 0.22 m^3/s 4.51 m^3/s 0.01m^3/s 0.01m^3/s	0.5 m^3/s, year round 0.68 m^3/s 0.47 m^3/s 0.39 m^3/s 4.62 m^3/s 0.01m^3/s 0.01m^3/s	Lower, but more consistent summer, fall and winter flows are provided from this headwater lake. The late summer release of 2 –3 m^3/s is not possible with the new plan.

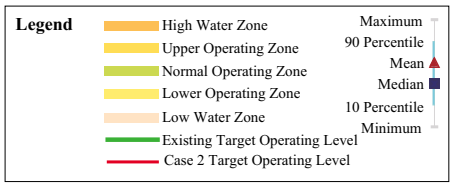
McCraney Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



Note : Vertical scale larger (i.e. 6m) than other lake plots (i.e. 4m) due to existing large seasonal water level change.

* Derived from ARSP Model

Figure 11.2.1
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - McCraney Lake

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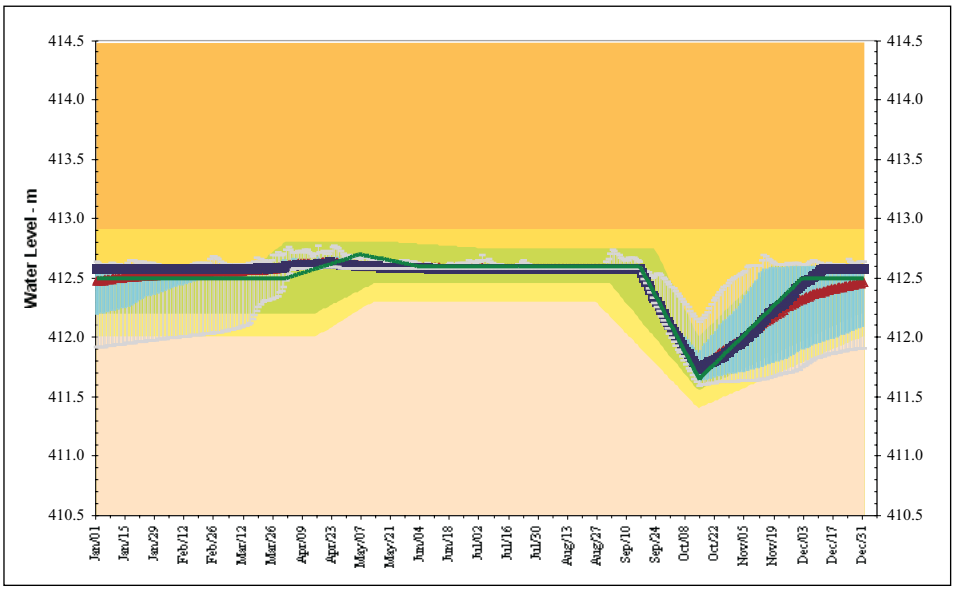
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11.2.2 Camp Lake

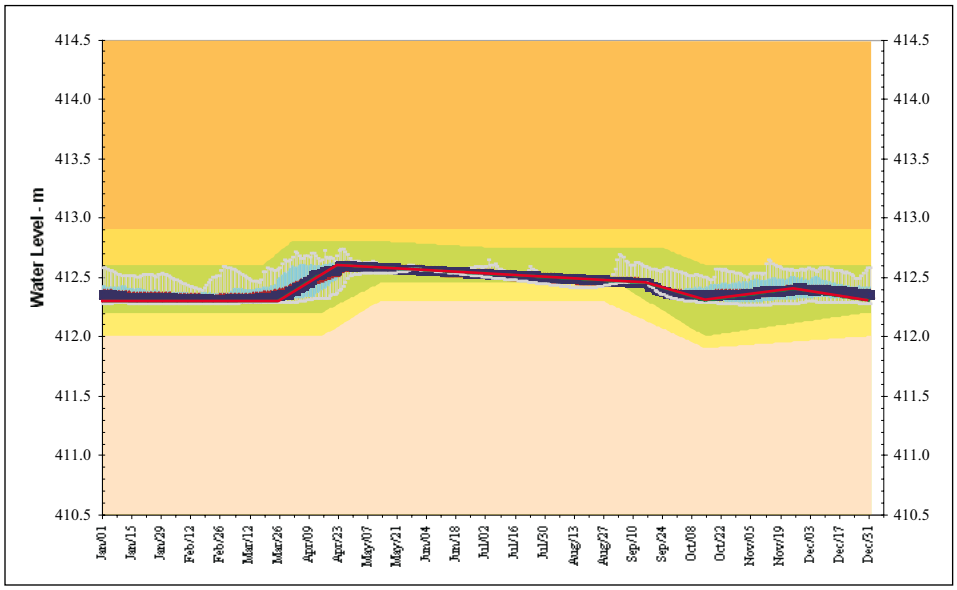
The proposed plan is compared to the present operating plan in Table 11.2.2 and Figure 11.2.2. The proposed changes for this lake are mostly related to a reduced fall drawdown, which required an adjustment to the limits of the present NOZ during that time period. It is anticipated that fewer dam operations will be required to achieve the proposed water level and flow regime.

Table 11.2.2 Camp Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date TOL Change WL Direction	412.8 412.2 – 412.45 412.7 – 412.6 April 16 0.1 Down	412.8 412.2 – 412.45 412.75 – 412.65 April 23 0.1 Down	Same NOZ, but higher spring peak with gradual spring/summer drawdown to September 30.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	412.8 – 412.75 412.45 – 412.15 412.6 0 -	412.8 412.45 – 412.3 412.5 – 412.45 0.2 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	412.75 –412.0 412.15-411.55 412.6 – 411.65 0.95 Down to Oct 15, then a natural rise.	412.75 – 412.6 412.3 – 412.0 412.45 – 412.15 0.3 Down to Oct 15, then a natural rise.	More stable fall water levels (less drawdown) should improve lake trout habitat in the long term.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	412.6 411.95 – 412.2 412.5 0 -	412.6 412.15 – 412.2 412.5 0 -	Stable winter water level.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	1 m^3/s, by leakage 0.19 m^3/s 0.16 m^3/s 0.07 m^3/s 2.18 m^3/s 0.01 m^3/s 0.01 m^3/s	0.25 m^3/s, year round 0.22 m^3/s 0.25 m^3/s 0.1 m^3/s 2.04 m^3/s 0.09 m^3/s 0.07 m^3/s	Consistent summer, fall and winter flows to maintain habitat values in Tasso Creek (especially for brook trout).

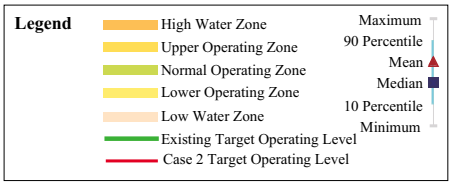
Camp Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.2
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Camp Lake

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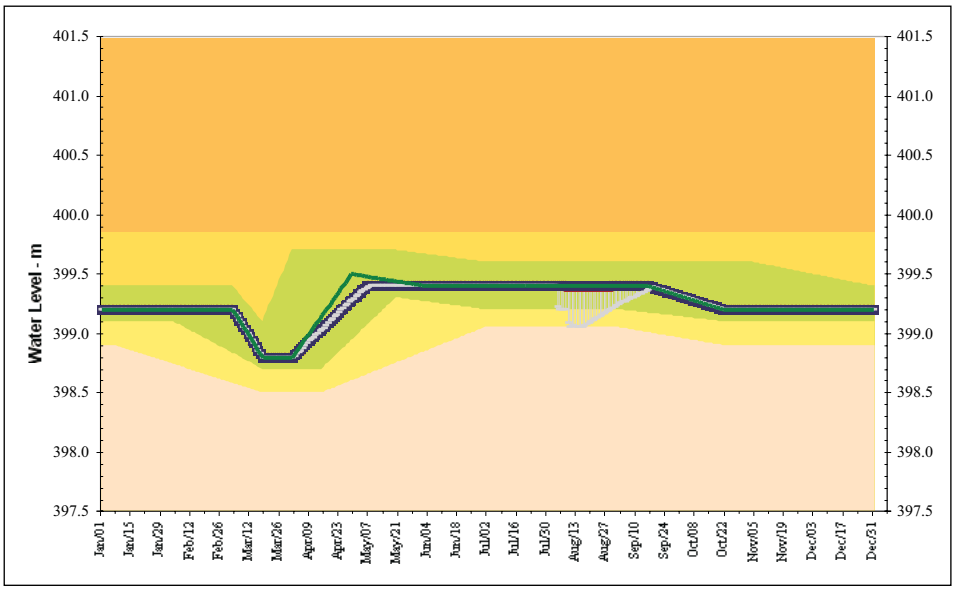
11.2.3 Tasso Lake

The proposed plan is compared to the present operating plan in Table 11.2.3 and Figure 11.2.3. The proposed changes for this lake are minor and were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water level and flow regime.

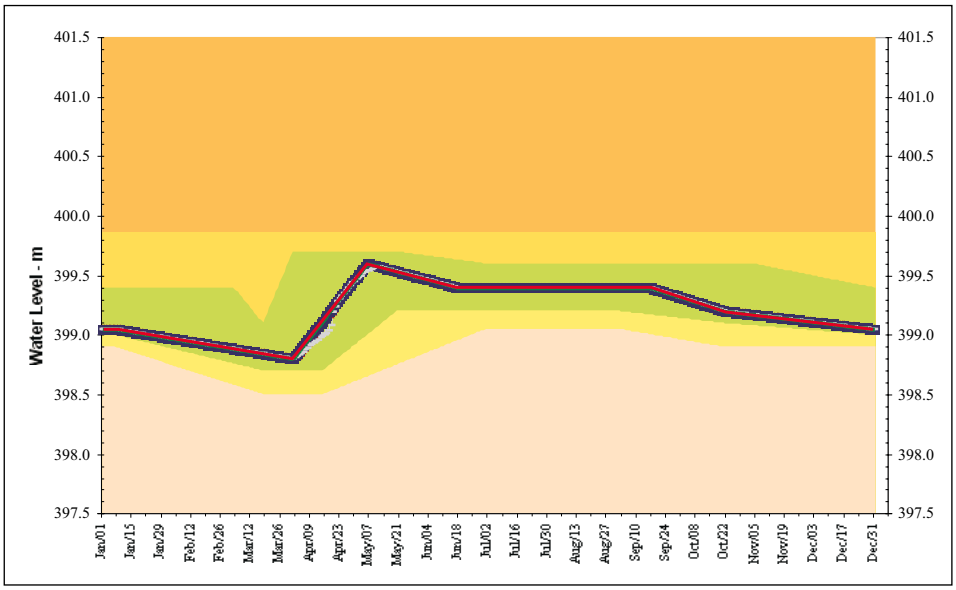
Table 11.2.3
Tasso Lake

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	399.7 – 399.67 398.7 – 399.27 399.5 – 399.4 May 6 0.1 Down	399.7 – 399.65 398.7 – 399.2 399.6 – 399.5 May 6 0.1 Down	Same NOZ, but higher spring peak. No change to summer level.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	399.67 – 399.6 399.27 – 399.17 399.4 0 -	399.65 – 399.6 399.2 – 399.15 399.5 – 399.4 0.1 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	399.6 – 399.5 399.17 – 399.1 399.4 – 399.2 0.2 Down to Oct 15, then a constant level.	399.6 – 399.5 399.15 – 399.05 399.4 – 399.1 0.3 Down, proceeds into winter.	Fall drawdown proceeds smoothly into winter drawdown (same end point). Lake trout not affected by fall drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	399.5 – 399.4 399.1 – 398.5 399.2 – 398.8 0.4 Down, March 1 to 15.	399.5 – 399.15 399.05 – 398.7 399.1 – 398.85 0.25 Down, to March 15	Gradual decline to winter target level rather than a sharp drop.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	0.5 m^3/s, by leakage 0.49 m^3/s 0.5 m^3/s 0.17 m^3/s 5.43 m^3/s 0.12 m^3/s 0.05 m^3/s	0.5 m^3/s, year round 0.52 m^3/s 0.61 m^3/s 0.19 m^3/s 5.06 m^3/s 0.14 m^3/s 0.01 m^3/s	Consistent summer, fall and winter flows to maintain habitat value in Tasso Creek (especially for brook trout).

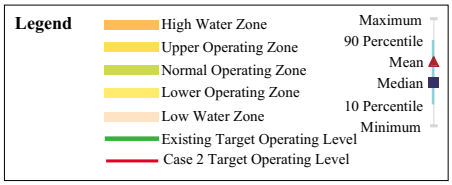
Tasso Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.3
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Tasso Lake

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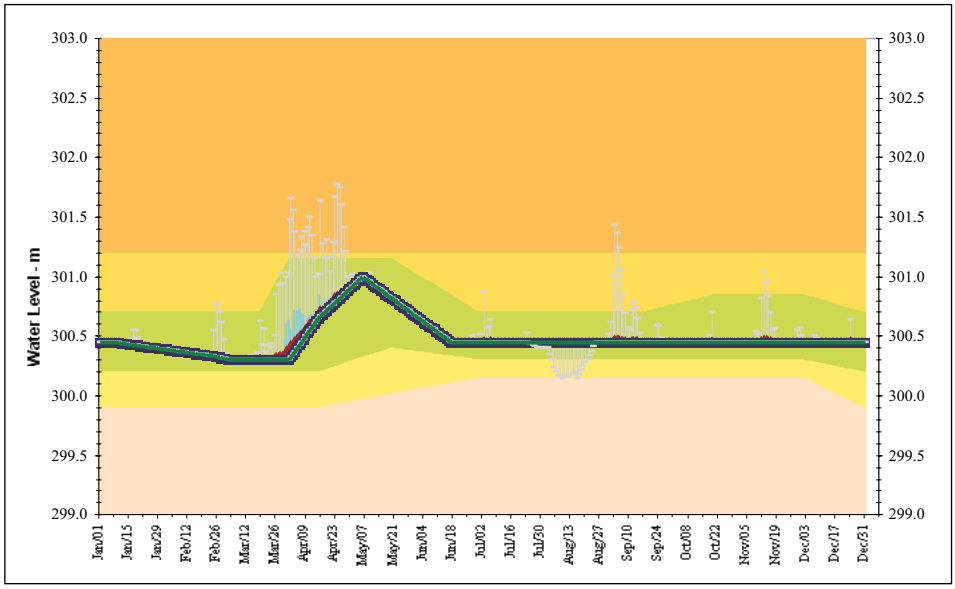
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11.2.4 Buck Lake

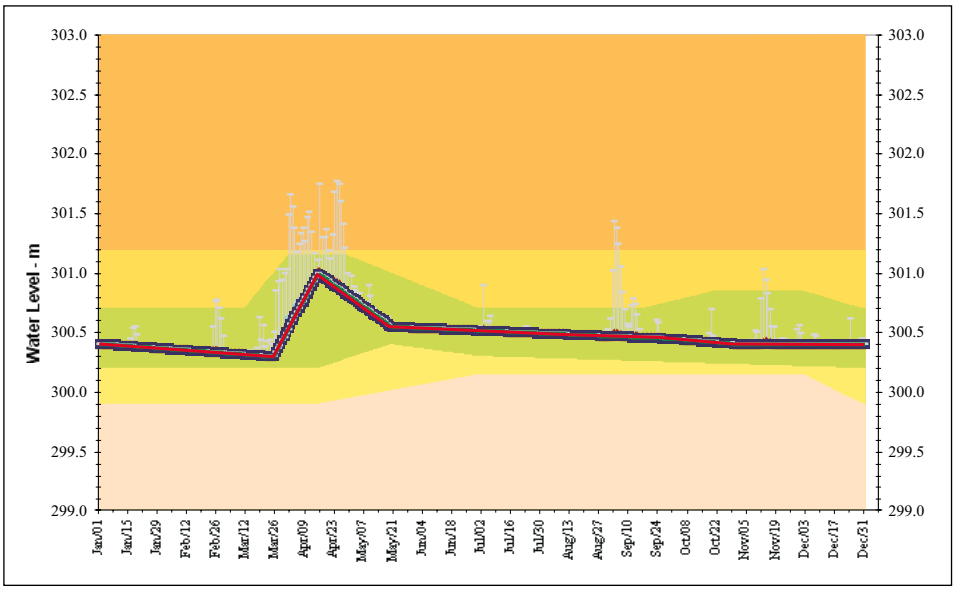
The proposed plan is compared to the present operating plan in Table 11.2.4 and Figure 11.2.4. The proposed changes for this lake are minor and were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water level and flow regime.

Table 11.2.4 Buck Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	301.15 – 301.0 300.2 – 300.4 301.0 – 300.63 May 6 0.37 Down	301.15 – 301.0 300.2 – 300.4 301.0 – 300.55 April 15 0.45 Down	Same NOZ, but earlier spring peak. Gradual decline to same September 15 level over the summer.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	301.0 – 300.7 300.37 – 300.3 300.63 - 300.45 0.18 Down, before June 15	301.0 – 300.7 300.37 – 300.3 300.55 – 300.45 0.1 Down, over summer	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	300.7 – 300.85 300.3 300.45 0 -	300.7 – 300.85 300.3 – 300.2 300.45 – 300.4 0.05 Down proceeds into winter.	Gradual drawdown through fall and early winter.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	300.85 – 300.7 300.3 – 300.2 300.45 – 300.3 0.15 Down, Jan 1 to March 15	300.85 – 300.7 300.2 300.4 – 300.3 0.1 Down, to March 15	More gradual decline to same winter target level.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	None, some leakage 2.14 m^3/s 2.73 m^3/s 0.83 m^3/s 24.69 m^3/s 0.75 m^3/s 0.41 m^3/s	1 m^3/s, year round 2.11 m^3/s 2.7 m^3/s 0.85 m^3/s 25.64 m^3/s 0.68 m^3/s 0.38 m^3/s	Consistent summer, fall and winter flows to maintain habitat value in Buck River into Fox Lake.

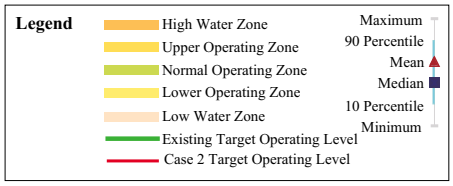
Buck Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.4
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Buck Lake

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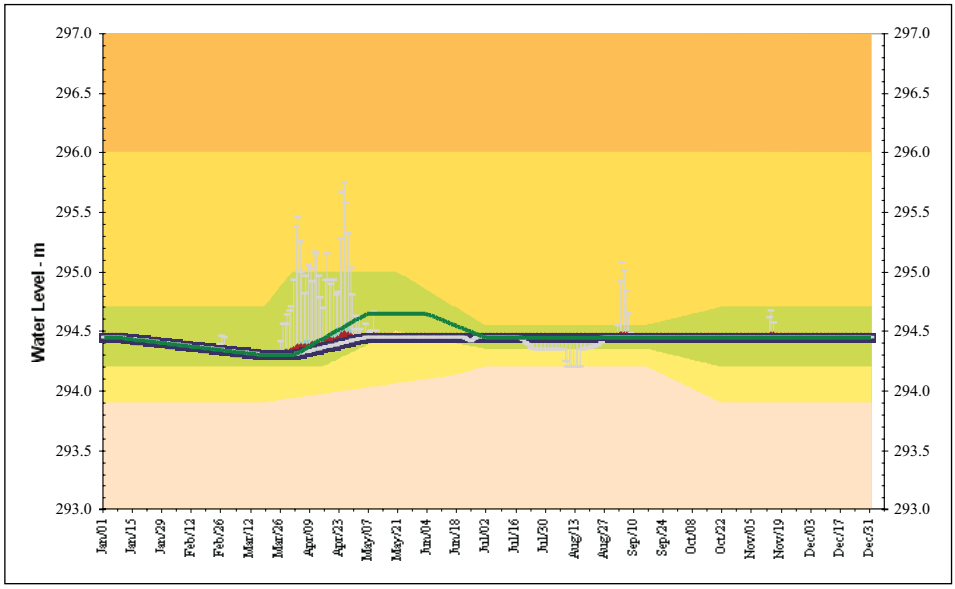
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11.2.5 Fox Lake

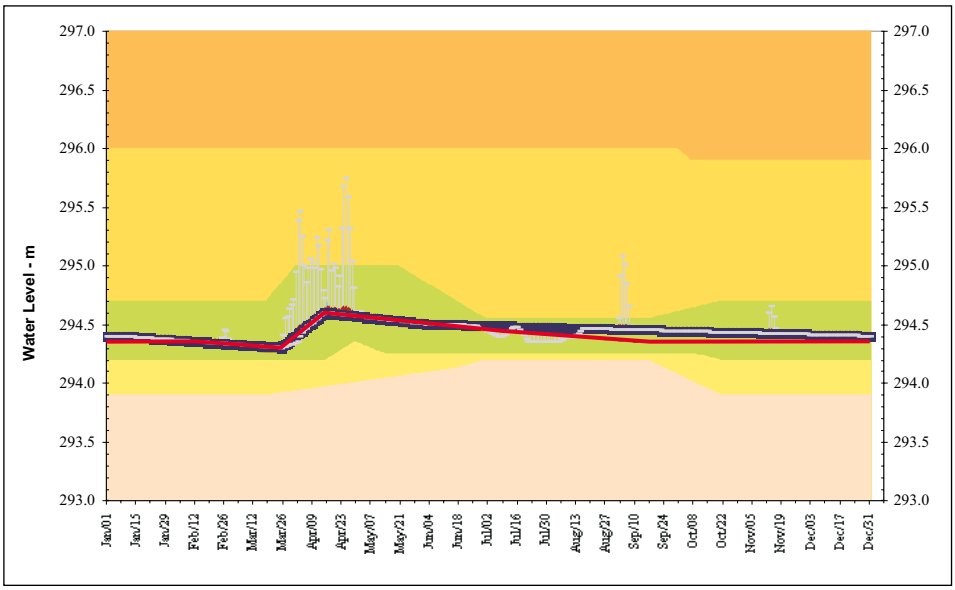
The proposed plan is compared to the present operating plan in Table 11.2.5 and Figure 11.2.5. The proposed changes for this lake were the subject of additional discussion with lake representatives, and resulted in an adjustment to the lower limit of the NOZ to accommodate a lower late summer TOL. It is anticipated that a similar number of dam operations will be required to achieve the proposed water level and flow regime.

Table 11.2.5 Fox Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	295.0 – 294.85 294.2 – 294.5 294.65 April 26 0 -	295.0 – 294.85 294.2 – 294.35 294.6 – 294.5 April 15 0.1 Down	Slightly earlier spring peak, and expanded NOZ to accommodate lower summer level requested by lake residents. Gradual decline over the summer period to a 10 cm lower level by September 15 level.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	294.85 – 294.55 294.45 – 294.35 294.65 – 294.45 0.2 Down, before July 1	294.85 – 294.55 294.35 – 294.25 294.5 – 294.35 0.15 Down, over summer	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	294.55 – 294.7 294.35 – 294.2 294.45 0 -	294.55 – 294.7 294.25 – 294.2 294.35 0 -	Ten centimeter lower fall level, with no water level change through fall and early winter.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	294.7 294.2 294.45 – 294.3 0.15 Down, Jan 1 to March 15	294.7 294.2 294.35 – 194.3 0.05 Down, to March 15	More gradual decline to same winter target level.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	0.7 m^3/s, by leakage 2.28 m^3/s 2.92 m^3/s 0.88 m^3/s 25.55 m^3/s 0.8 m^3/s 0.43 m^3/s	1 m^3/s, year round 2.25 m^3/s 2.87 m^3/s 0.91 m^3/s 26.76 m^3/s 0.66 m^3/s 0.36 m^3/s	Consistent summer, fall and winter flows to maintain habitat value in Buck River into Fox Lake.

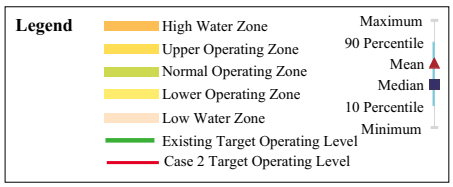
Fox Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.5
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Fox Lake

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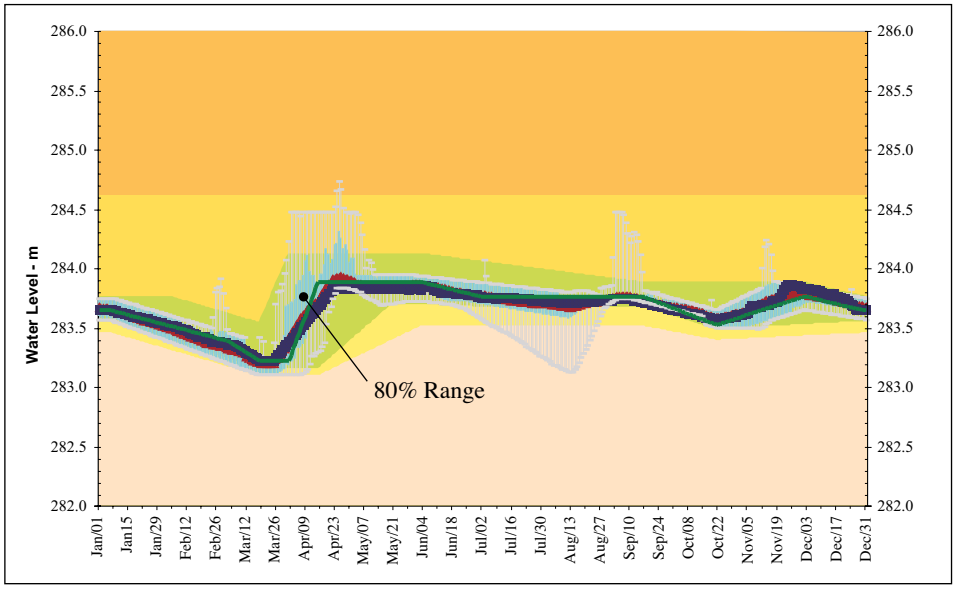
11.2.6 Huntsville Lakes

The proposed plan is compared to the present operating plan in Table 11.2.6 and Figure 11.2.6. The proposed changes for these lakes are minimal and were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water level and flow regime.

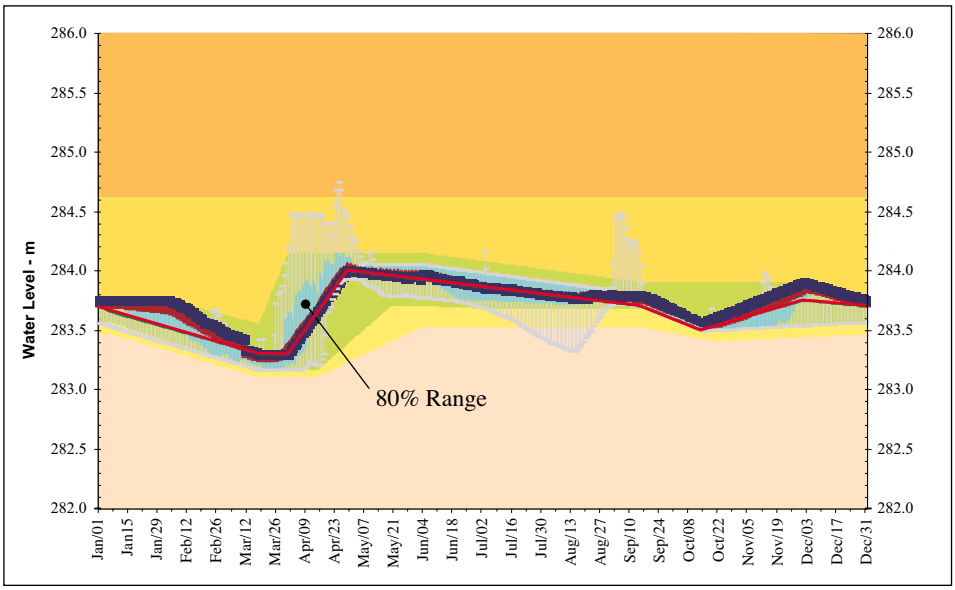
Table 11.2.6
Huntsville Lakes

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	284.13 283.16 – 283.7 283.89 April 22 0 -	284.13 283.16 – 283.7 284.0 – 283.9 April 29 0.1 Down	Same NOZ, but slightly higher spring peak. Gradual decline to slightly lower September 15 level over the summer.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	284.13 – 283.89 283.7 – 183.68 283.89 – 283.77 0.12 Down, before July 1	284.13 – 283.89 283.7 – 183.68 283.9 - 283.7 0.2 Down, over summer	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	283.89 283.68 – 283.49 283.77 – 283.53 0.12 Down, Sept 15 to Oct 15, followed by natural rise.	283.89 283.68 – 283.49 283.7 - 283.5 0.2 Down, Sept 15 to Oct 15, followed by natural rise.	Similar fall drawdown (for lake trout habitat).
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	283.89 – 283.55 283.53 – 283.16 283.77 – 283.23 0.54 Down, Jan 1 to March 15	283.89 – 283.55 283.53 – 283.16 283.75 – 283.3 0.45 Down, to March 15	Slightly less winter drawdown to reduce fall/winter water level differential to improve lake trout habitat.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	3 m^3/s - summer 11 m^3/s, winter 12.94 m^3/s 17.5 m^3/s 4.63 m^3/s 123.28 m^3/s 4.2 m^3/s 1.52 m^3/s	3 m^3/s, year round 11 m^3/s, winter 11.26 m^3/s 15.56 m^3/s 4.82 m^3/s 126.85 m^3/s 4.19 m^3/s 1.62 m^3/s	Consistent summer, fall and winter minimum flow to maintain social and ecological habitat values in North Branch leading into Mary Lake.

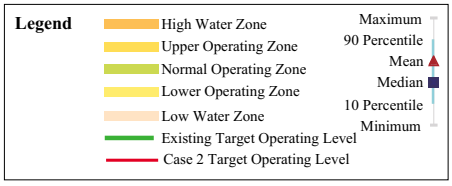
Huntsville Lakes



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.6
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Huntsville Lakes

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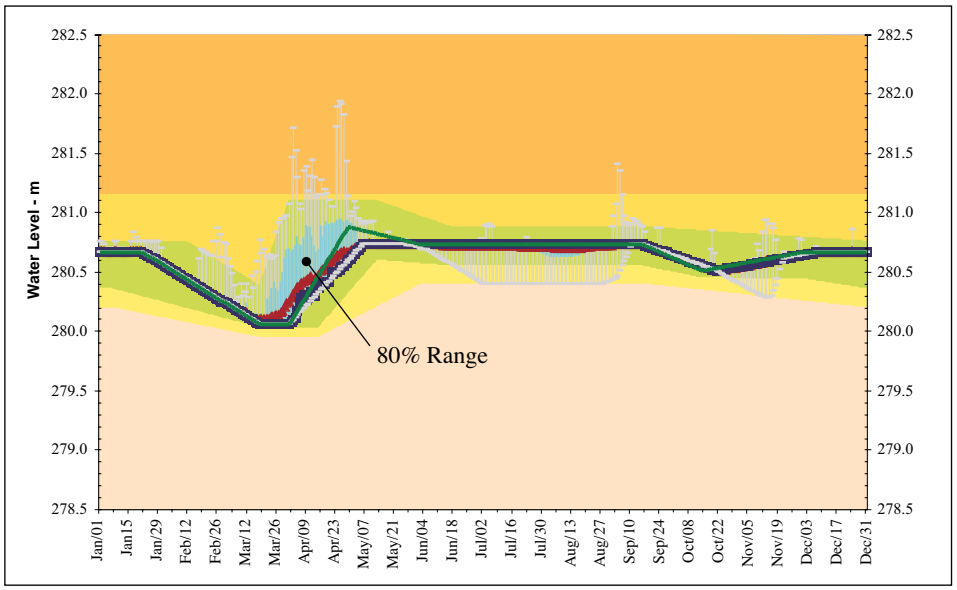
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11.2.7 Mary Lake

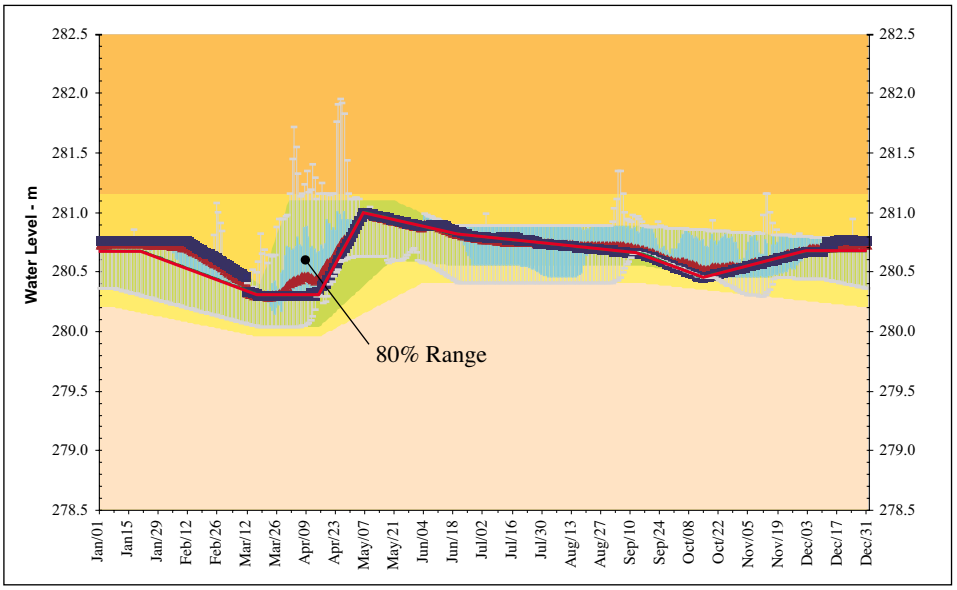
The proposed plan is compared to the present operating plan in Table 11.2.7 and Figure 11.2.7. The proposed changes for this lake were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water level and flow regime.

Table 11.2.7 Mary Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	281.1 - 281.0 280.03 - 280.6 280.88 – 280.73 April 26 0.15 Down	281.1 - 281.0 280.03 - 280.6 281.0 – 280.9 May 6 0.1 Down	Same NOZ, but slightly higher (12 cm) spring peak and early summer level with a gradual decline during the summer to a 0.08 cm (3") lower September 15 level.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	281.0 – 280.88 280.6 – 280.55 280.73 0 -	281.0 – 280.88 280.6 – 280.55 280.9 – 280.65 0.25 Down, over summer	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	280.88 – 280.79 280.55 – 280.45 280.73 – 280.51 0.22 Down, Sept 15 to Oct 15, followed by natural rise to 280.67 by Dec 1.	280.88 – 280.79 280.55 – 280.45 280.65 – 280.45 0.2 Down, Sept 15 to Oct 15, followed by natural rise to 280.67 by Dec 1.	Slightly more fall drawdown (0.06 m) for lake trout habitat.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	280.79 – 280.39 280.51 – 280.03 280.67 – 280.06 0.61 Down, Jan 15 to March 15	280.79 – 280.39 280.51 – 280.03 280.67 – 280.3 0.37 Down, Jan 15 to March 15	Less winter drawdown to reduce fall/winter water level differential (from 0.45 m to 0.15 m) to improve lake trout habitat.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	3 m^3/s, summer 11 m^3/s, winter 14.92 m^3/s 20.47 m^3/s 5.61 m^3/s 136.55 m^3/s 4.91 m^3/s 3.0 m^3/s	3 m^3/s, year round 11 m^3/s, winter 13.57 m^3/s 17.77 m^3/s 5.89 m^3/s 140.55 m^3/s 5.09 m^3/s 3.0 m^3/s	Consistent summer, fall and winter minimum flow to maintain social and ecological habitat values in North Branch leading into Mary Lake.

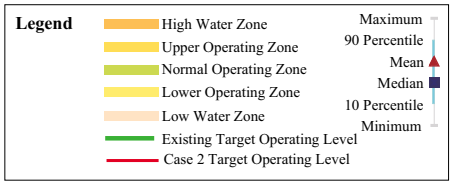
Mary Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.2.7
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Mary Lake

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11.2.8 High Falls Generating Station and Head Pond

The proposed plan is compared to the present operating plan in Table 11.2.8 and Figure 11.2.8. The facility is run-of-river, presently has no legally defined operating limits, and has generally remained within the self-imposed NOZ elevations noted in Table 11.2.8 (see present operating summary in part a) of Figure 11.2.8). The absolute operating range for the facility (i.e., which would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 2.75 m (268.5 m elevation to 271.25 m elevation).

Bracebridge Generation has received the necessary government approvals and is currently expanding the facility to include a second generator. The expansion is expected to be completed by the end of 2005. A specific seasonal flow regime over the falls was agreed upon during the environmental process (EA) process and will be provided after the expansion is complete (see Section 12.1.8 for details). The operating levels presented in this document will be adhered to at all times after plan implementation (including after installation of the new unit).

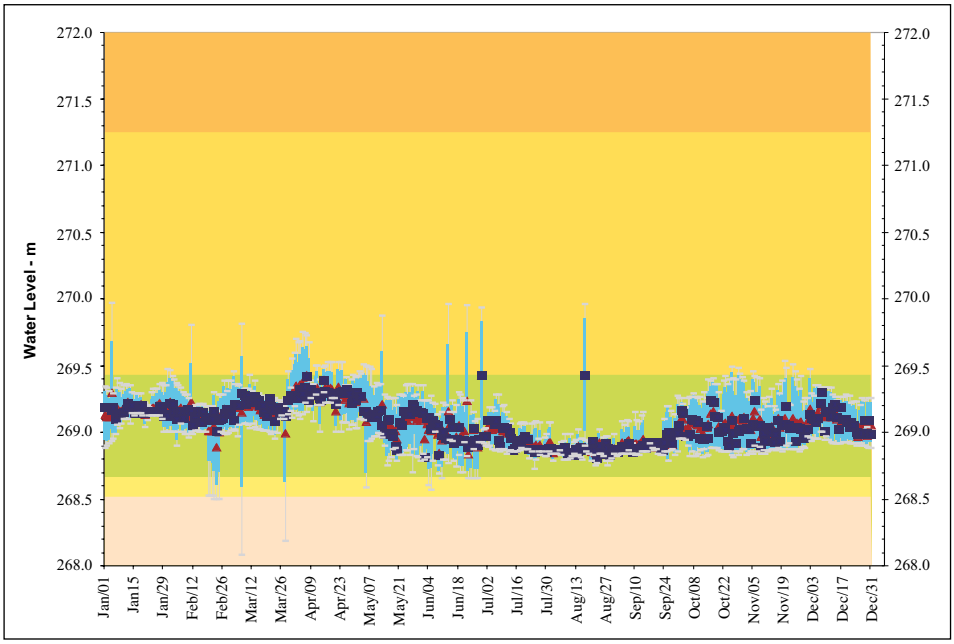
The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in their head ponds in response to energy demands. However, a 'BMP' line has been established at 269.0 m elevation from June 15 to September 15 to address public comments concerning head pond levels below the crest of the overflow weir (weir crest at 269.1 m) during the summer recreation period. BBG has agreed to operate above this level during the noted period unless unusual circumstances prevail. It is anticipated that more attention to dam operation will be required to ensure river levels are maintained within the proposed NOZ than with the present operating plan.

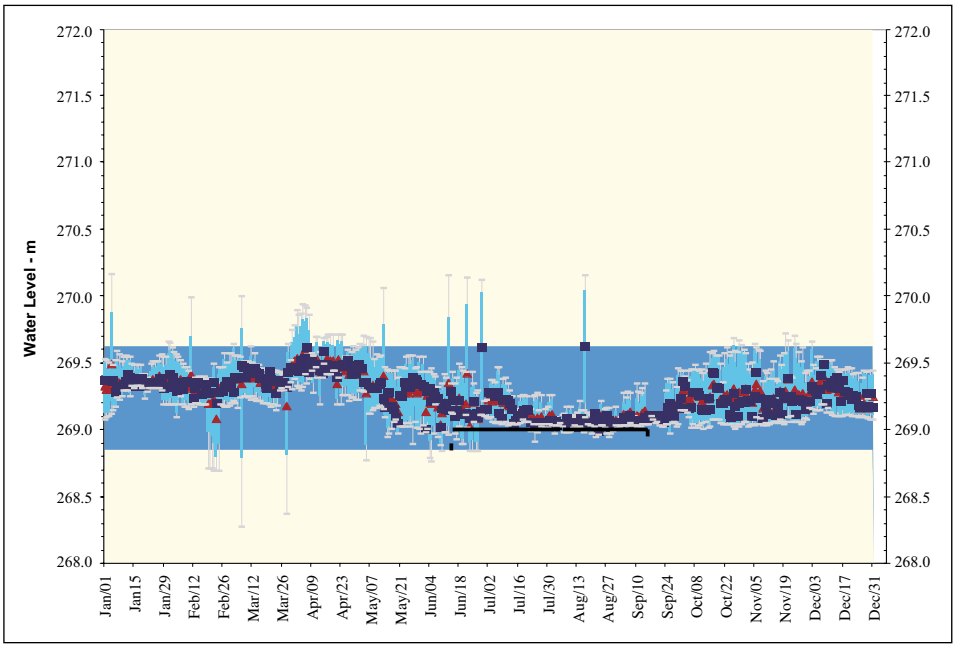
Table 11.2.8
High Falls Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	271.25 269.43 268.66 268.5 None None None	Upper NOZ 269.62 268.85 Lower NOZ None 80 3	Historic water level fluctuations were typically 0.5 m on average, although absolute fluctuations could be as much as 1.5 m. The proposed plan provides an operating range of 0.77 m under normal operating conditions.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	271.25 269.43 268.66 268.5 None None None	Upper NOZ 269.62 268.85 Lower NOZ None 80 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	271.25 269.43 268.66 268.5 None None None	Upper NOZ 269.62 268.85 Lower NOZ None 80 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	271.25 269.43 268.66 268.5 None None None	Upper NOZ 269.62 268.85 Lower NOZ None 80 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	10.25 m^3/s annual average 16.24 m^3/s 22.17 m^3/s 5.89 m^3/s 150.96 m^3/s 5.33 m^3/s 3.25 m^3/s	10.35 m^3/s annual average 15.03 m^3/s 19.43 m^3/s 6.18 m^3/s 155.46 m^3/s 5.55 m^3/s 3.28 m^3/s	Consistent summer, fall and winter minimum flow to maintain social and ecological habitat values in North Branch leading into Lake Muskoka. Some redistribution of flow to summer season to offset lower winter flow in river system

High Falls GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

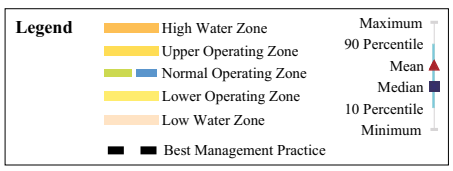


Figure 11.2.8
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - High Falls GS

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11.2.9 Wilson Falls Generating Station and Head Pond

The proposed plan is compared to the present operating plan in Table 11.2.9 and Figure 11.2.9. The facility is run-of-river, presently has no legally defined operating limits, and has generally remained within the self-imposed NOZ elevations noted in Table 11.2.9 (see present operating summary in part a) of Figure 11.2.9). The absolute operating range for the facility (i.e., which would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 2.45 m (256.15 m elevation to 253.7 m elevation).

Additional investigations were undertaken during the development of the plan to resolve an identified discrepancy between historic water level elevations and the elevations of known, fixed points at the facility. As a result, the water levels noted in part a) of Figure 11.2.9 are considered inaccurate, although the range of water level change is considered representative of the range of water levels experienced in the head pond and river upstream of the facility. The range and specific levels provided for the new plan are based on a topographic survey of the facility and structures, and an engineering evaluation of the flow handling capacity of the various structures (i.e., powerhouse and main dam). Reporting of operational parameters (see Section 13) will confirm that the new operating range is appropriate for the facility.

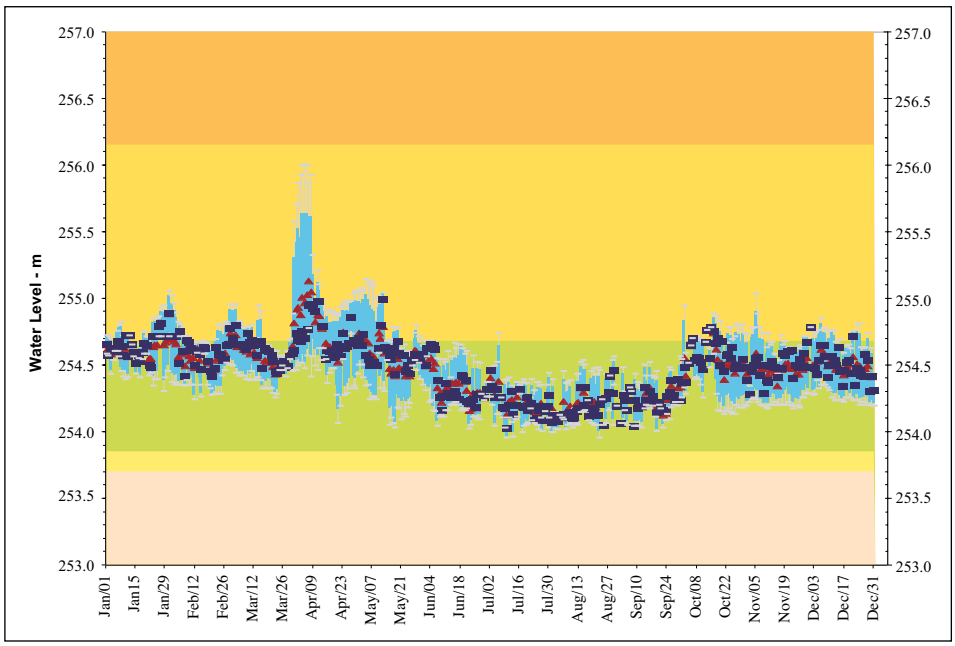
The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in their head ponds in response to energy demands. However, a 'BMP' line has been established at 254.29 m elevation from June 15 to September 15 to address public comments pertaining to head-pond levels below the crest of the overflow weir (weir crest at 254.34 m) during the summer recreation period. BBG has agreed to operate above this level during the noted period unless unusual circumstances prevail. It is anticipated that more attention to dam operation will be required to ensure river levels are maintained within the proposed NOZ than with the present operating plan.

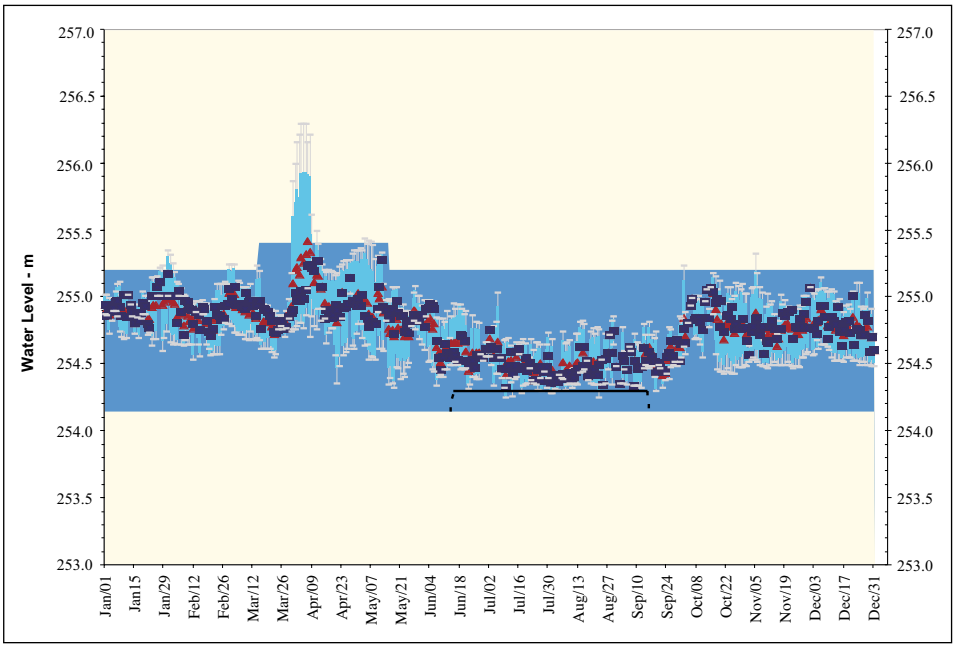
Table 11.2.9
Wilson Falls Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	256.15 254.68 253.85 253.17 None None None	Upper NOZ 255.4 254.14 Lower NOZ None 65 3	Historic water level fluctuations were typically 1.0 m on average, although absolute fluctuations could be as much as 2.0 m. The proposed plan provides an operating range of 1.26 m under spring high flow conditions and 1.06 m for the remainder of the year.
Summer Water Level (May 15 to Sept 15)	Upper Limit (m) Upper Zone (m) Lower Zone (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	256.15 254.68 253.85 253.17 None None None	Upper NOZ 255.2 254.14 Lower NOZ None 65 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	256.15 254.68 253.85 253.17 None None None	Upper NOZ 255.2 254.14 Lower NOZ None 65 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	256.15 254.68 253.85 253.17 None None None	Upper NOZ 255.2 254.14 Lower NOZ None 65 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	10.28 m^3/s annual average 16.56 m^3/s 22.55 m^3/s 6.0 m^3/s 154.9 m^3/s 5.43 m^3/s 3.32 m^3/s	10.37 m^3/s annual average 15.32 m^3/s 19.84 m^3/s 6.27 m^3/s 159.4 m^3/s 5.66 m^3/s 3.34 m^3/s	Consistent summer, fall and winter minimum flow to maintain social and ecological habitat values in North Branch leading into Lake Muskoka. Some redistribution of flow to summer season to offset lower winter flow in river system

Wilson Falls GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

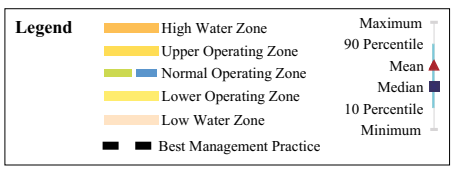


Figure 11.2.9
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Wilson Falls GS

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11.2.10 Birds Mill Dam

The Bird's Mill Dam has no power generating facilities and its principal role is to facilitate nearby recreational uses (navigation, fishing, etc). The streamflow through the dam is entirely dependent on the water that is available in the natural flow of the river. Compliance with the operating levels noted herein will be on a voluntary basis.

The main objective of the dam operation is to regulate water levels within the reach of river from Bird's Mill Dam to Wilson's Falls. In actual fact, the greatest effect of the dam on water level is limited to the area between Bird's Mill Dam and a natural rock outcrop within the river, some 1000 m upstream of the dam, known locally as "Bass Rock".

Water levels are controlled by the placement or removal of stop logs within the three sluices. Gradual logging will take place to reduce the impact at the Bracebridge Falls facility downstream. The dam is typically operated in response to seasonal flow changes and information provided by the MNR, a reaction to high flow events or diminishing flows. Despite the use of the dam to facilitate recreational activities an over-riding consideration in operating the dam is the avoidance of flooding on River Road. To a great extent, the spillways naturally regulate water levels.

Current Operating Procedures

Fall Operation

- River flows can vary substantially during this period and water levels are controlled in response to flow information provided by the MNR.
- Sluiceway operation is usually limited to Dam No. 1 and Dam No. 2.

Winter Operation

- Normally the dam is not operated in winter.
- Most of the stop logs are in place.

Spring Operation

- River flows due to spring runoff usually warrant the removal of most, if not all of the stop logs in all three sluiceways.
- As the river flow decreases, stop logs are set back in place to maintain desired water levels.

Summer Operation

- Normally the dam is not operated during the summer.
- Most of the stop logs are in place.
- An attempt is made to have the water level at a point where the river flow cascades over the concrete retaining wall (spillway) between Dam No. 2 and Dam No. 3, for aesthetics.

Proposed Operating Range

The operating range is based on two factors: to facilitate recreational use of the river reach and to avoid flooding of River Road. No historical information is available on water levels.

The elevation of the top of a catch basin grate on River Road is 243.08. In determining the upper level, a 0.3-m freeboard from this grate is desirable. The lower level is exclusively dependent on the natural flow of the river. Suggested lower level could be 0.3 m below the concrete retaining wall (spillway) between Dam No. 2 and Dam No. 3 (elevation = 242.076 m).

Operating Range

- Upper Level – 242.7 m
- Lower Level – 241.7 m.

11.2.11 Bracebridge Falls Generating Station and Head Pond

The proposed plan is compared to the present operating plan in Table 11.2.10 and Figure 11.2.10. The facility is run-of-river, presently has no legally defined operating limits, and has generally remained within the self-imposed NOZ elevations noted in Table 11.2.10 (see present operating summary in part a) of Figure 11.2.10). Historic data is extremely limited as the facility was manned on a regular basis, with operational levels established by reference to fixed, visual points (i.e., data was not recorded). The absolute operating range for the facility (i.e., which would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 3.16 m (235.6 m elevation to 238.76 m elevation).

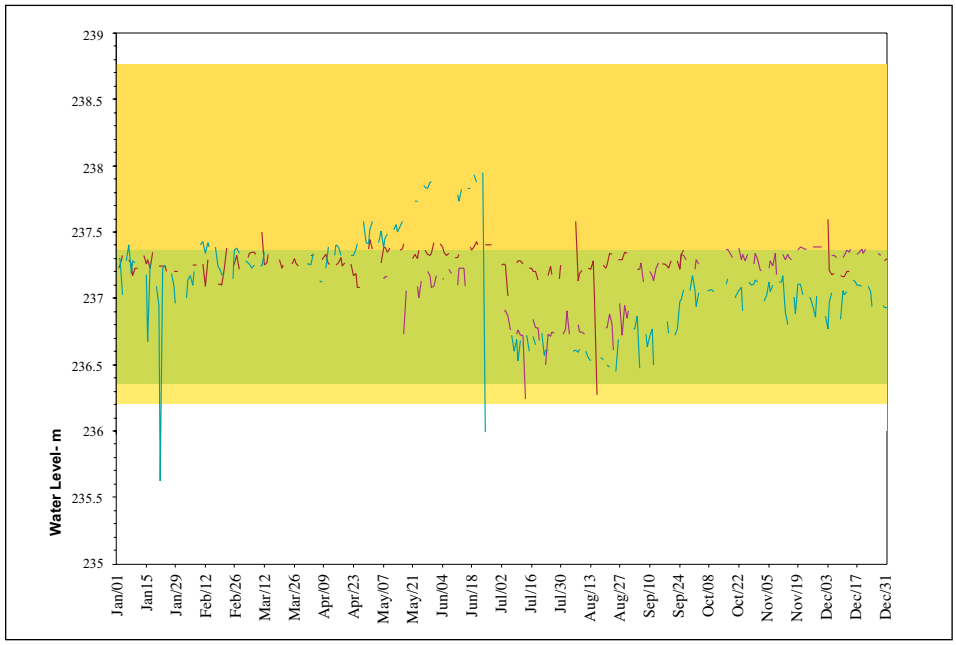
The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in their head ponds in response to energy demands. A relatively wide operating zone is proposed due to the very small size of the head pond (approximately 100 m long by 35 m wide) and its ability to be strongly influenced by inflows and operational changes, a general absence of environmental and social values in the head pond, and its location immediately downstream of another operational structure that is not controlled by Bracebridge Generation (flows may change quickly due to operating changes at that structure). It is anticipated that more attention to dam operation will be required to ensure river levels are maintained within the proposed NOZ than with the present operating plan.

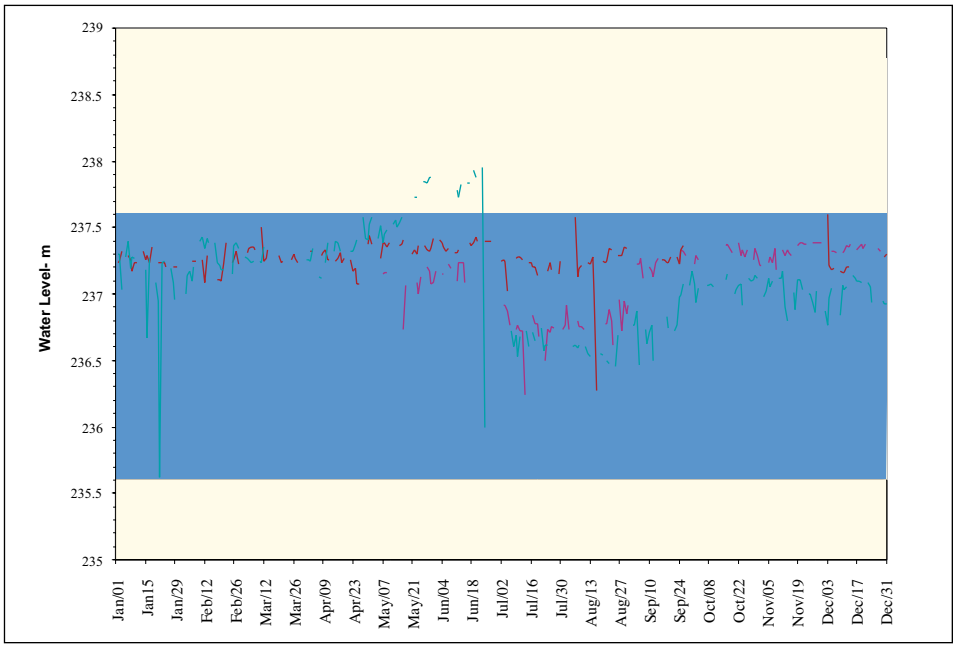
Table 11.2.10
Bracebridge Falls Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	238.76 237.36 236.35 235.6 None None None	Upper NOZ 237.6 235.6 Lower NOZ None 65 3	Historic water level fluctuations were often 1.5 m or more, although limited data is available. The proposed plan provides an operating range of 2.0 m throughout the year.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	238.76 237.36 236.35 235.6 None None None	Upper NOZ 237.6 235.6 Lower NOZ None 65 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	238.76 237.36 236.35 235.6 None None None	Upper NOZ 237.6 235.6 Lower NOZ None 65 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	238.76 237.36 236.35 235.6 None None None	Upper NOZ 237.6 235.6 Lower NOZ None 65 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	11.87 m^3/s annual average 16.68 m^3/s 22.69 m^3/s 6.19 m^3/s 156.35 m^3/s 5.47 m^3/s 3.34 m^3/s	12.01 m^3/s annual average 15.44 m^3/s 20.0 m^3/s 6.6 m^3/s 161.01 m^3/s 5.7 m^3/s 3.37 m^3/s	Consistent summer, fall and winter minimum flow to maintain social and ecological habitat values in North Branch leading into Lake Muskoka. Some redistribution of flow to summer season to offset lower winter flow in river system

Bracebridge Falls GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

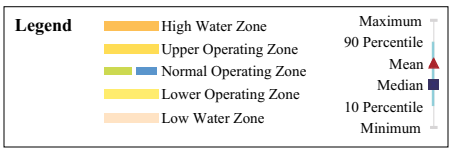


Figure 11.2.10
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Bracebridge Falls GS

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11.3 South Branch Subwatershed

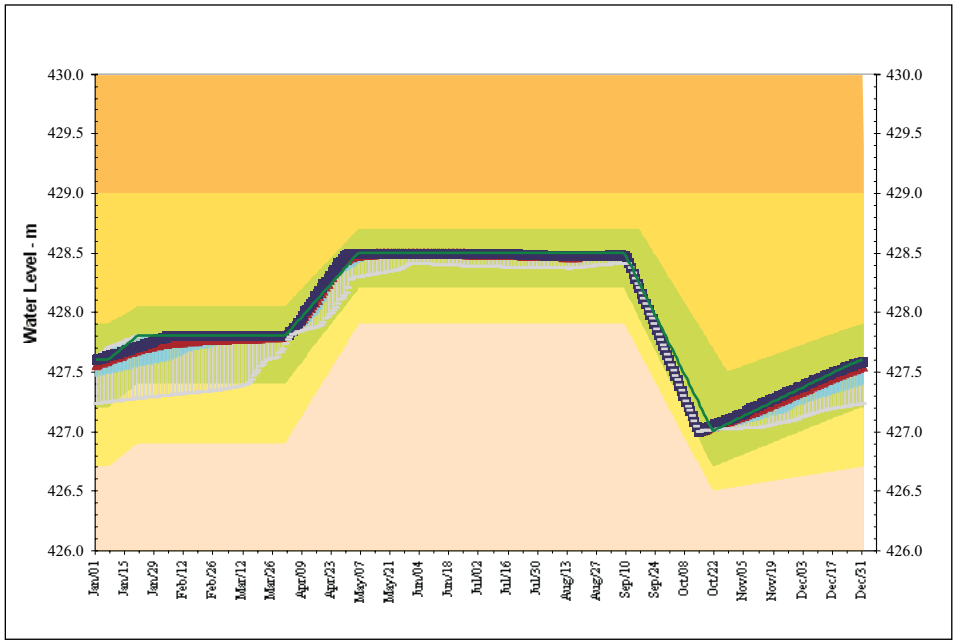
11.3.1 Burnt Island Lake

The proposed plan is compared to the present operating plan in Table 11.3.1 and Figure 11.3.1. The proposed changes for this lake required an adjustment of the NOZ to accommodate the changes in the fall and winter water levels. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

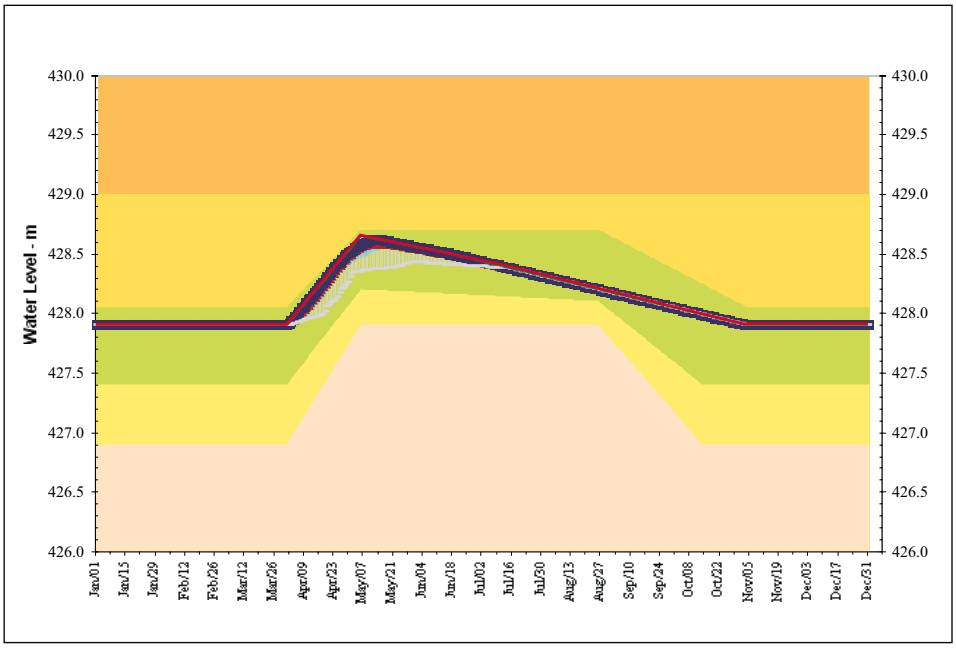
Table 11.3.1
Burnt Island Lake

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	428.7 428.2 428.5 May 2 0 -	428.7 428.2 428.65 – 428.55 May 12 0.1 Down	A more natural water level regime with a higher spring peak and gradual seasonal drawdown will improve ecological conditions for wetlands and spring spawning amphibians and fish species. Reduction in late summer drawdown will improve recreational uses.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	428.7 428.2 – 427.83 428.5 – 428.13 0.37 Down	428.7 – 428.5 428.2 – 427.83 428.55 – 428.1 0.45 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	428.7 – 427.5 427.83 – 426.7 428.13 – 427.0 1.13 Down	428.5 – 428.05 427.83 – 427.4 428.1 – 427.9 0.2 Down	Potential to improve lake trout habitat by reducing seasonal drawdown range.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	427.73 – 428.05 427.0 – 427.35 427.4 – 427.75 0.35 Rise	428.05 427.4 427.9 0 -	Stable over-winter level
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	5-6 m^3/s, Sept 15 to Oct 15 only 0.6 m^3/s 0.05 m^3/s 0.35 m^3/s 8.1 m^3/s 0.0 m^3/s 0.0 m^3/s	0.5 m^3/s annual average 0.94 m^3/s 0.66 m^3/s 0.64 m^3/s 7.82 m^3/s 0.0 m^3/s 0.0 m^3/s	More consistent summer, fall and winter flows are provided from this headwater lake – the fall release (September 15 to October 15) of 5-6 m^3/s is eliminated.

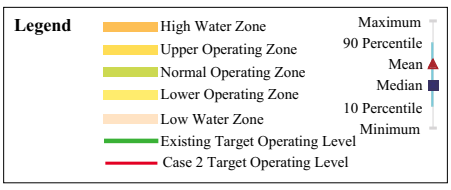
Burnt Island Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.1
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Burnt Island Lake

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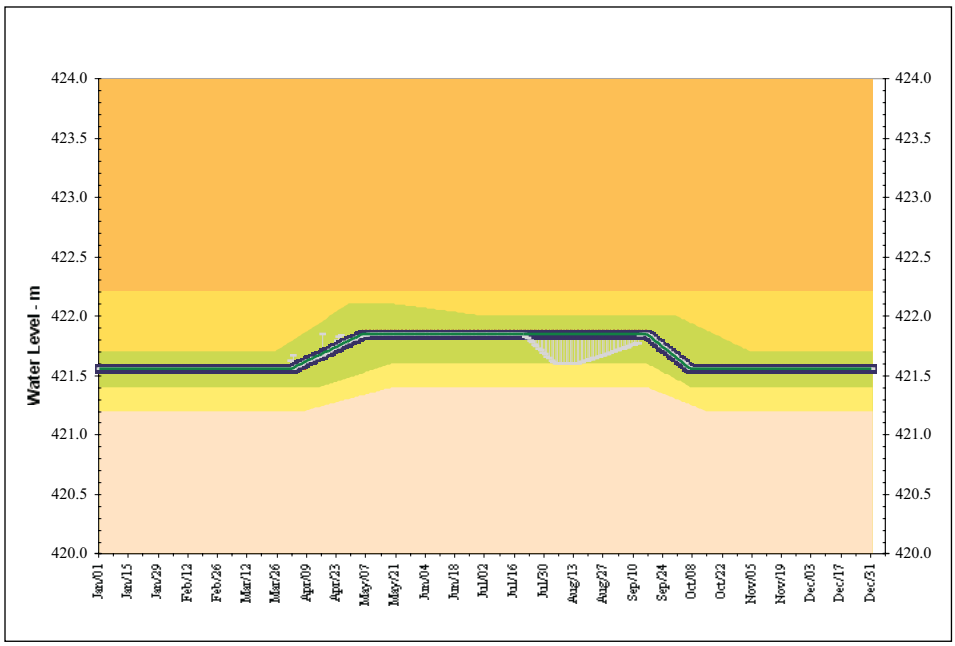
11.3.2 Joe Lake

The proposed plan is compared to the present operating plan in Table 11.3.2 and Figure 11.3.2. The proposed changes increase the range of the TOL, but remain within the NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

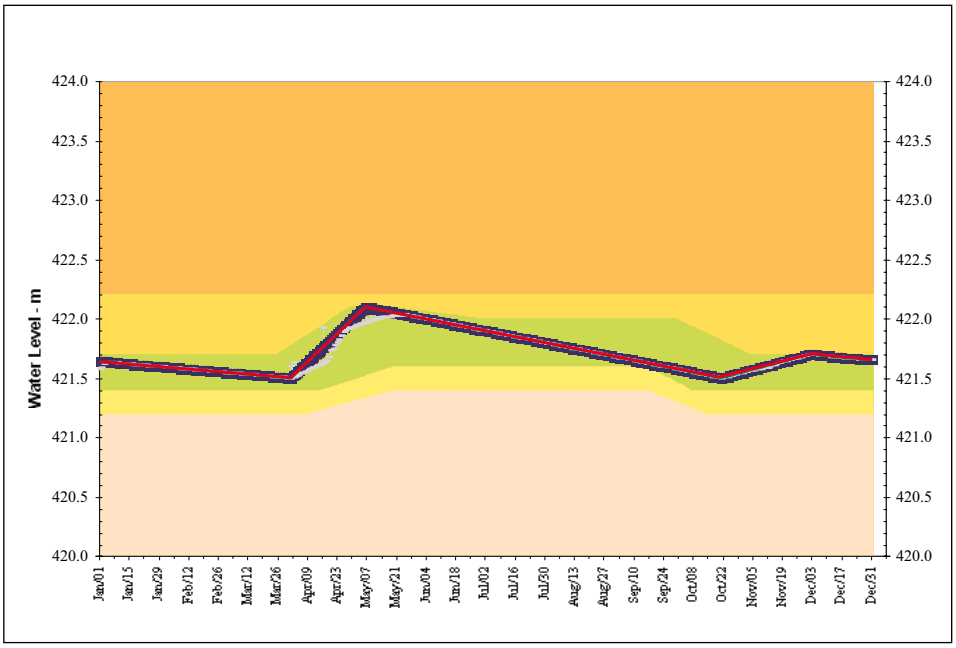
Table 11.3.2
Joe Lake

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	422.1 421.4 – 421.6 421.9 May 6 0 -	422.1 421.4 – 421.6 422.1 – 422.0 May 7 0.1 Down	A more natural water level regime with a higher spring peak and gradual seasonal drawdown will improve ecological conditions for wetlands and spring spawning amphibians and fish species.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	422.1 – 422.0 421.6 421.9 – 421.85 0.05 Down	422.1 – 422.0 421.6 422.0 – 421.63 0.37 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	422.0 – 421.7 421.6 – 421.4 421.85 - 421.55 0.3 Down	422.0 – 421.7 421.6 – 421.4 421.63 – 421.5 0.2 Down, then natural rise to 421.7	Drawdown to similar October 15 level for lake trout spawning, followed by natural rise to pre-drawdown level by the end of November.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	421.7 421.4 421.55 0 -	421.7 421.4 421.7 – 421.5 0.2 Down	Slow decline over winter to a similar elevation as the present plan.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	0.7m^3/s, Sept 15 to Oct 15 only 1.33 m^3/s 0.97 m^3/s 0.6 m^3/s 15.29 m^3/s 0.33 m^3/s 0.06 m^3/s	0.5 m^3/s annual average 1.74 m^3/s 1.41 m^3/s 1.11 m^3/s 15.48 m^3/s 0.26 m^3/s 0.0 m^3/s	More consistent summer, fall and winter flows are provided from this headwater lake – the fall drawdown (September 15 to October 15) is eliminated.

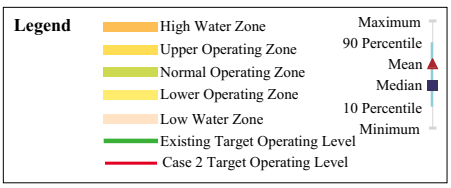
Joe Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.2
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Joe Lake

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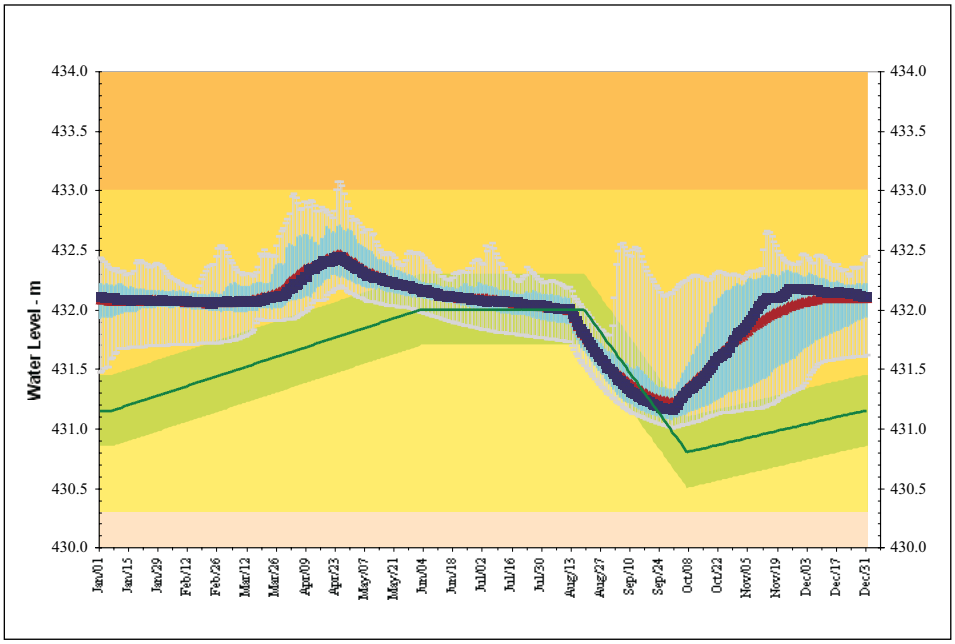
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11.3.3 Ragged Lake

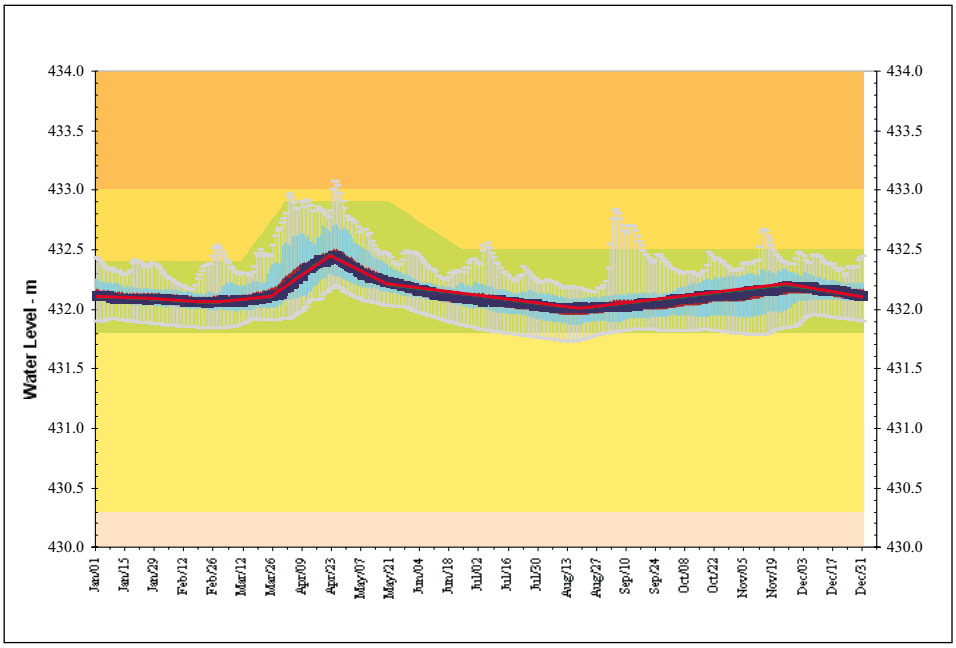
The proposed plan is compared to the present operating plan in Table 11.3.3 and Figure 11.3.3. The dam has not been operated since 2002, is partially breached, and will not be repaired. The operating plan replicates the water levels that are presently taking place under the normal range of hydrologic conditions (i.e., with no operation of the dam) and will allow the lake to be self-regulating. The NOZ provided encompasses the natural variability of lake levels, while the TOL replicates the long-term average levels. No future dam operations are proposed.

Table 11.3.3 Ragged Lake				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	432.6 431.75 – 432.0 432.3 April 20 0 -	432.9 – 432.75 431.8 432.45 – 432.15 April 20 0.3 Down	A more natural water level regime with a higher spring peak and gradual seasonal drawdown will improve ecological conditions for wetlands and spring spawning amphibians and fish species.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	432.6 432.0 – 430.8 432.3 –431.1 1.2 Down	432.75 – 432.5 431.8 432.15 – 432.0 0.15 Down, followed by natural rise	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	432.6 – 431.48 430.8 – 431.05 431.1 - 431.35 0.25 Down	432.5 431.8 432.05 – 432.2 0.15 Rise	Natural rise in response to fall rains.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	431.64 – 432.28 431.05 – 431.58 431.35 – 431.88 0.53 Rise	432.5 431.8 432.2 – 432.05 0.15 Down	A slow decline over the winter.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	2.0 m^3/s, Aug 15 to Sept 15 only 1.03 m^3/s 0.87 m^3/s 0.16 m^3/s 6.74 m^3/s 0.01m^3/s 0.0 m^3/s	0.5 m^3/s annual average 0.74 m^3/s 0.97 m^3/s 0.42 m^3/s 7.82 m^3/s 0.42 m^3/s 0.26 m^3/s	More consistent summer, fall and winter flows are provided from this headwater lake. Higher base flow values in downstream reach.

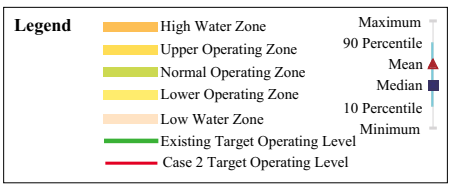
Ragged Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.3
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Ragged Lake

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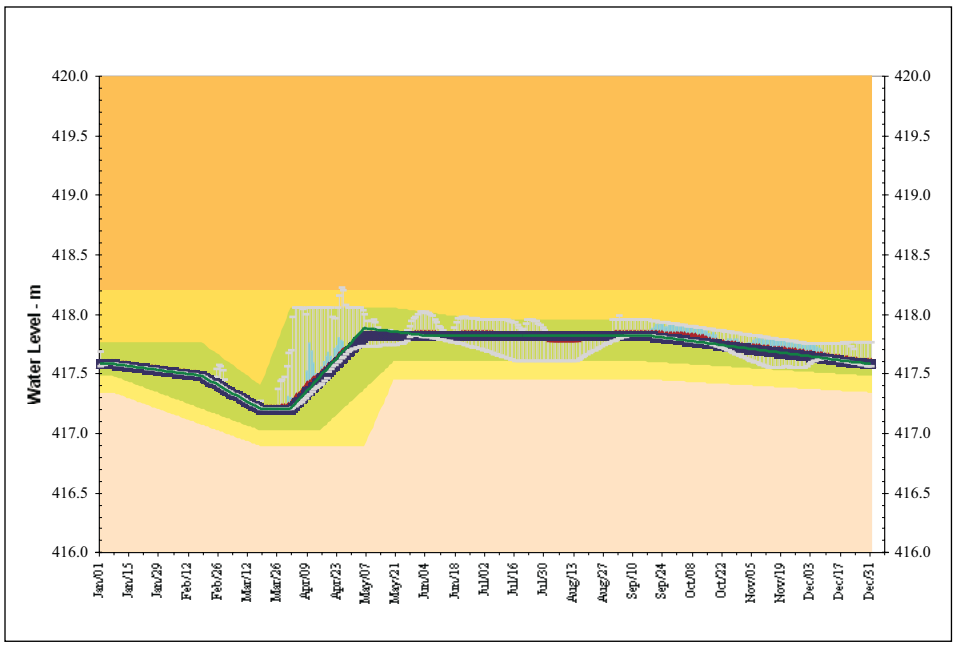
11.3.4 Canoe, Tea and Smoke Lakes

The proposed plan is compared to the present operating plan in Table 11.3.4 and Figure 11.3.4. The proposed changes increase the range of the TOL, and are within the current NOZ for these lakes. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

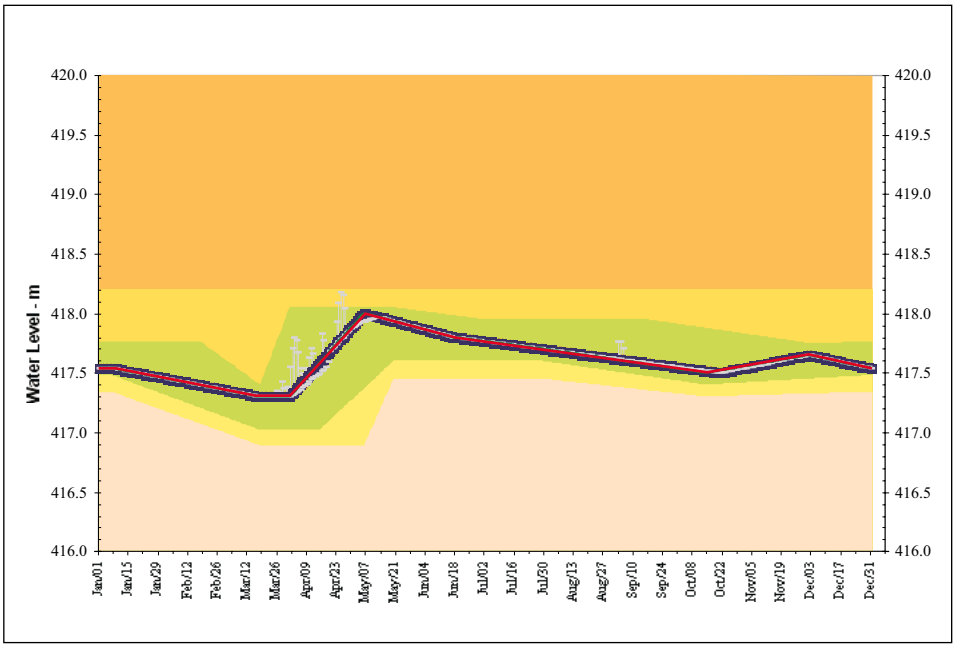
Table 11.3.4
Canoe, Tea and Smoke Lakes

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	418.05 417.02 – 417.3 417.88 - 417.82 May 6 0.06 Down	418.05 417.6 418.0 – 417.9 May 6 0.1 Down	A more natural water level regime with a higher spring peak and gradual seasonal drawdown will improve ecological conditions for wetlands and spring spawning amphibians and fish species.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	418.0 – 417.95 417.6 417.82 0 -	418.05 – 417.95 417.6 – 417.5 417.9 – 417.6 0.3 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	417.95 – 417.75 417.6 – 417.51 417.82 - 417.65 0.17 Down	417.95 – 417.75 417.5 – 417.45 417.6 – 417.5 0.1 Down, then natural rise to 417.65	Fall drawdown for lake trout spawning slightly increased (to 417.5 m), followed by natural rise to pre-drawdown level by the end of November.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	417.75 – 417.4 417.51- 417.02 417.65 – 417.2 0.45 Down	417.75 – 417.4 417.45 – 417.02 417.5 – 417.3 0.2 Down	Slow decline over winter to slightly higher winter target elevation to improve lake trout habitat.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	1.4 m^3/s minimum flow 4.59 m^3/s 4.32 m^3/s 1.93 m^3/s 38.88 m^3/s 1.4 m^3/s 0.15 m^3/s	1.5 m^3/s minimum flow 4.4 m^3/s 4.61 m^3/s 2.5 m^3/s 39.4 m^3/s 1.48 m^3/s 0.0 m^3/s	Very similar, consistent summer, fall and winter flows are provided from this lake.

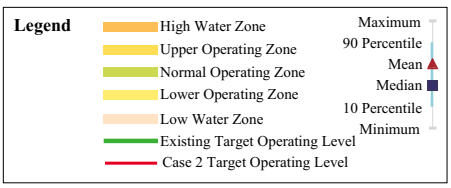
Tea,Smoke & Canoe Lakes



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.4
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Tea, Smoke and Canoe Lakes

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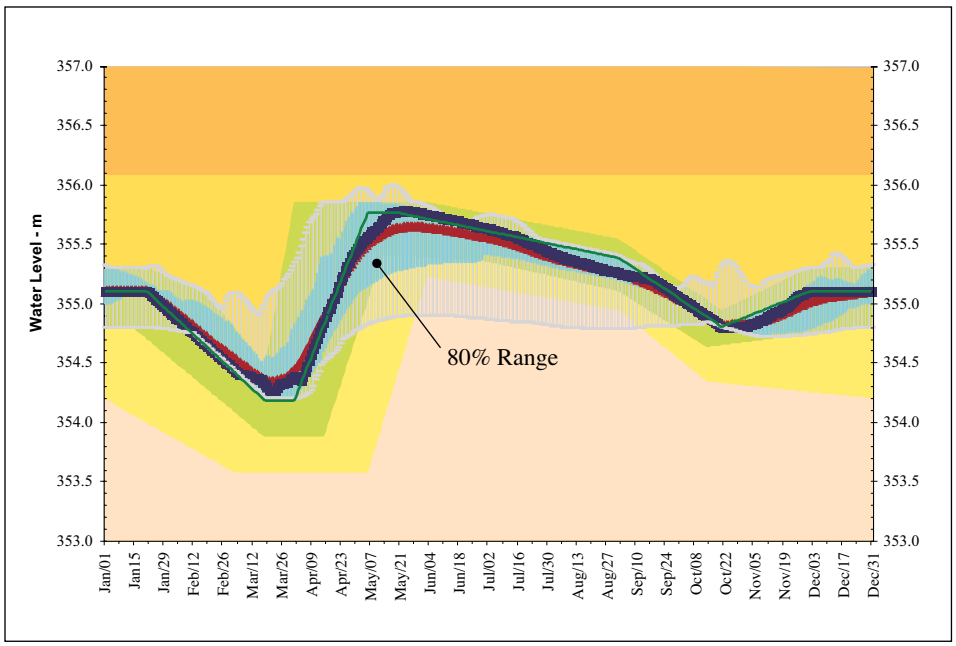
11.3.5 Kawagama Lake

The proposed plan is compared to the present operating plan in Table 11.3.5 and Figure 11.3.5. The proposed plan decreases the differential between the highest and lowest water levels of the TOL as well as the NOZ for the lake. It also provides a second BMP level which will be used to guide dam operations when conditions are favourable (i.e., when more than the average amount of rainfall and runoff is available during the summer season). This latter feature of the plan responds to comments provided by the Kawagama Lake Cottager's Association on the preliminary preferred strategy contained within the Options Report. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

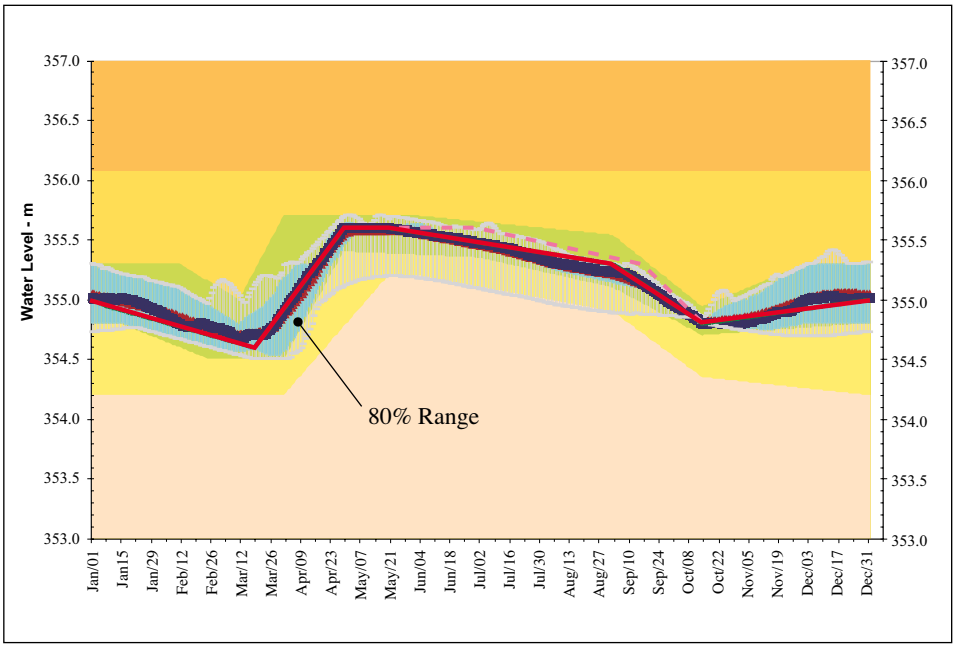
Table 11.3.5
Kawagama Lake

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	355.85 353.87 – 355.39 355.76 – 355.71 May 1 0.05 Down	355.7 354.5 – 355.4 355.6 – 355.55 May 1 0.05 Down	A lower spring peak to mitigate shoreline erosion. Summer levels approximately 0.1 m lower, and will follow the same drawdown pattern during normal or below normal rainfall and runoff years. When sufficient inflows are available, the lake will be operated to the higher and longer summer operating level (see Section 12 for additional detail).
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	355.85 – 355.34 355.39 – 354.94 355.71 – 355.19 0.52 Down	355.7 – 355.35 355.4 – 355.0 355.55 – 355.15 0.4 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	355.34 – 354.94 354.94 – 354.63 355.19 – 354.8 0.39 Down, then natural rise to 355.1	355.35 – 354.95 355.0 – 354.7 355.15 – 354.8 0.35 Down, then natural rise to 355.0	Drawdown to same October 15 level for lake trout spawning, followed by a natural rise prior to winter drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	355.3 – 354.46 354.73 – 353.87 355.1 – 354.18 0.92 Down	354.8 – 355.3 354.73 – 354.5. 355.0 – 354.6 0.4 Down	Slow decline in over-winter level to higher winter target elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	3 m^3/s summer, 0.92 m, Jan 1 to Mar 15 1.5 m^3/s 8.07 m^3/s 0.72 m^3/s 18.17 m^3/s 0.0 m^3/s 0.0 m^3/s	1.5 m^3/s summer, 0.4 m, Jan 1 to Mar 15 1.49 m^3/s 6.27 m^3/s 0.75 m^3/s 22.9 m^3/s 0.75 m^3/s 0.75 m^3/s	Similar summer outflows, lower winter outflows, and higher base flow values.

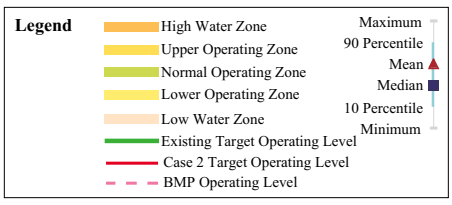
Kawagama Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.5
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Kawagama Lake

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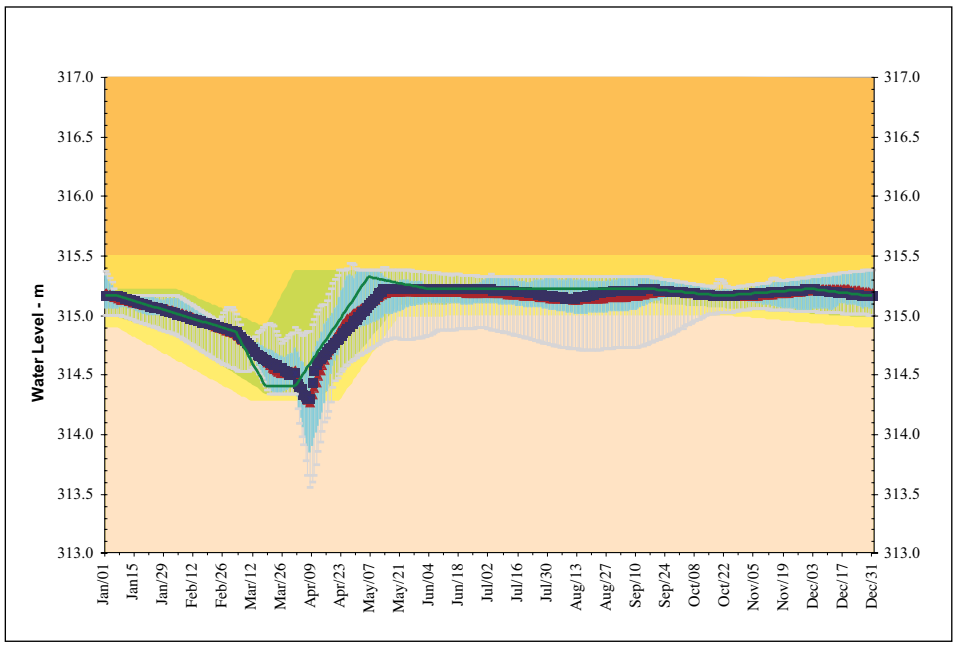
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11.3.6 Lake of Bays

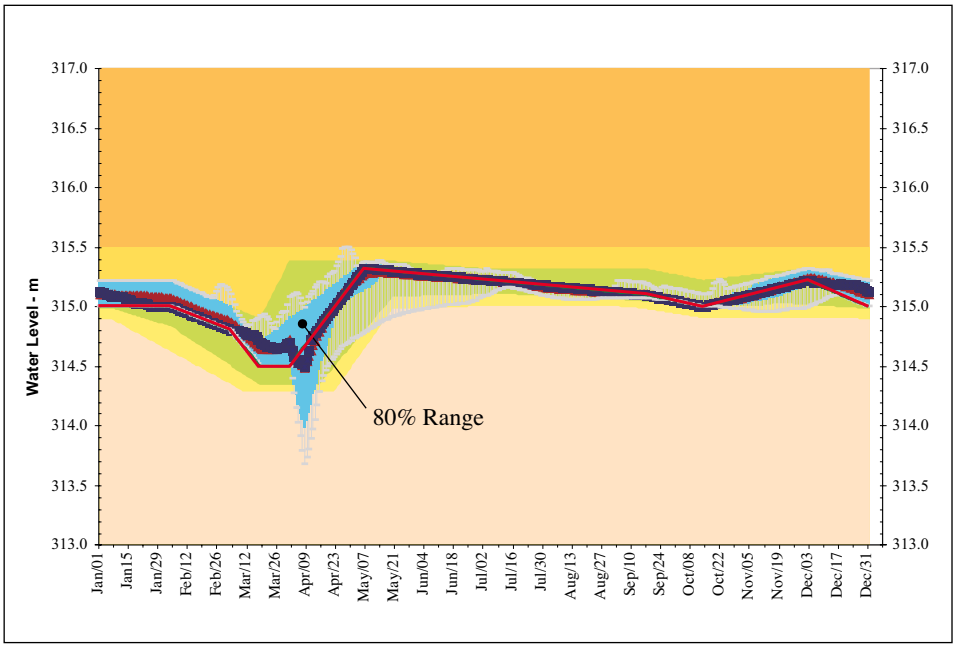
The proposed plan is compared to the present operating plan in Table 11.3.6 and Figure 11.3.6. The proposed plan decreases the differential between highest and lowest water levels of the TOL, but expands the lower limit of the NOZ during the fall period. A minimum flow of 5 m^3/s will be provided from the Baysville dam during the April 15 to June 1 period to ensure that adequate flow is available at the South Falls walleye spawning area. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

Table 11.3.6 Lake of Bays				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	315.38 314.34 – 315.09 315.32 – 315.22 May 14 0.1 Down	315.38 314.34 – 315.09 315.32 – 315.27 May 6 0.05 Down	A similar spring high water level, followed by a gradual summer drawdown to a target elevation approximately 0.14 m lower.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	315.38 – 315.29 315.09 – 315.09 315.22 – 315.19 0.03 Down	315.38 – 315.29 315.09 – 315.09 315.27 – 315.05 0.22 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	315.22 – 315.32 315.09 – 315.01 315.19 – 315.16 0.03 Down, then natural rise to 315.22	315.22 – 315.32 315.09 – 315.0 315.15 – 315.0 0.15 Down, then natural rise to 315.22	Lower October 15 drawdown level for lake trout spawning (by 0.16 m); followed by a natural rise to the same December 1 elevation prior to the winter drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	315.32 – 314.9 315.01 – 314.34 315.22 – 314.4 0.82 Down	315.32 – 314.9 315.0 – 314.34 315.22 – 314.5 0.68 Down	Slow decline in over-winter level to slightly higher (0.1 m) winter target elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	3 m^3/s summer, 17 m^3/s Oct 15 to Mar 1 nominally 6.76 m^3/s 25.75 m^3/s 2.86 m^3/s 77.45 m^3/s 1.5 m^3/s 1.5 m^3/s	5 m^3/s summer, 17 m^3/s Oct 15 to Mar 1 nominally 8.04 m^3/s 27.2 m^3/s 3.76 m^3/s 85.92 m^3/s 3.0 m^3/s 3.0 m^3/s	A minimum outflow of 5 m^3/s during the walleye spawning period (April 15 to June 1) to ensure a minimum flow of 3 m^3/s is available at the South Falls spawning site. Slightly higher summer and winter median weekly flow, and higher base flow values.

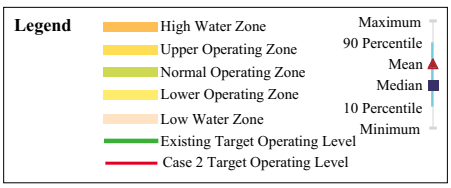
Lake of Bays



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.6
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Lake of Bays

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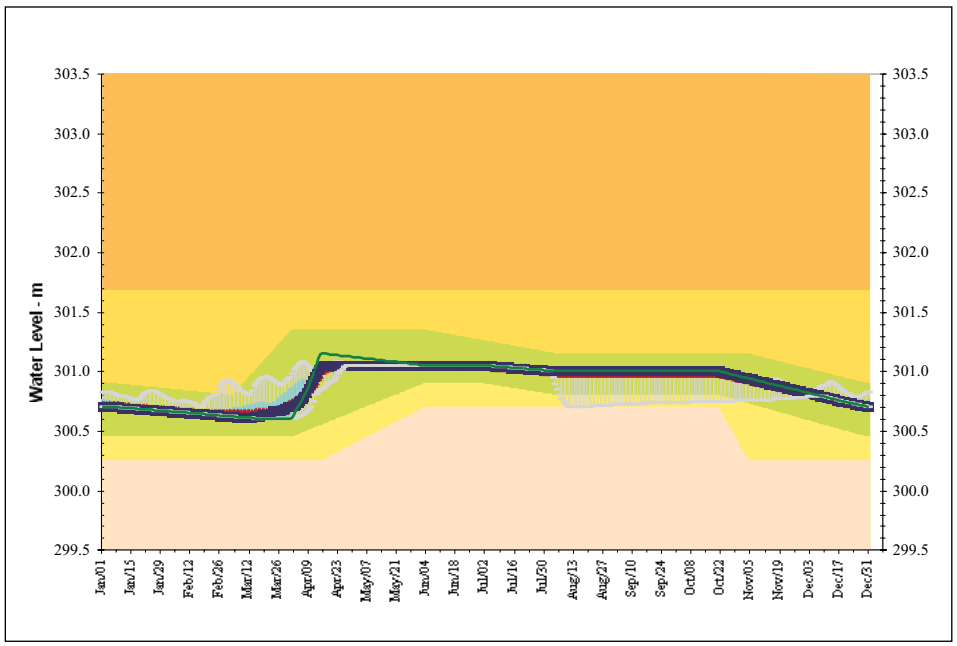
11.3.7 Wood Lake

The proposed plan is compared to the present operating plan in Table 11.3.7 and Figure 11.3.7. The proposed changes for this lake are minor and were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

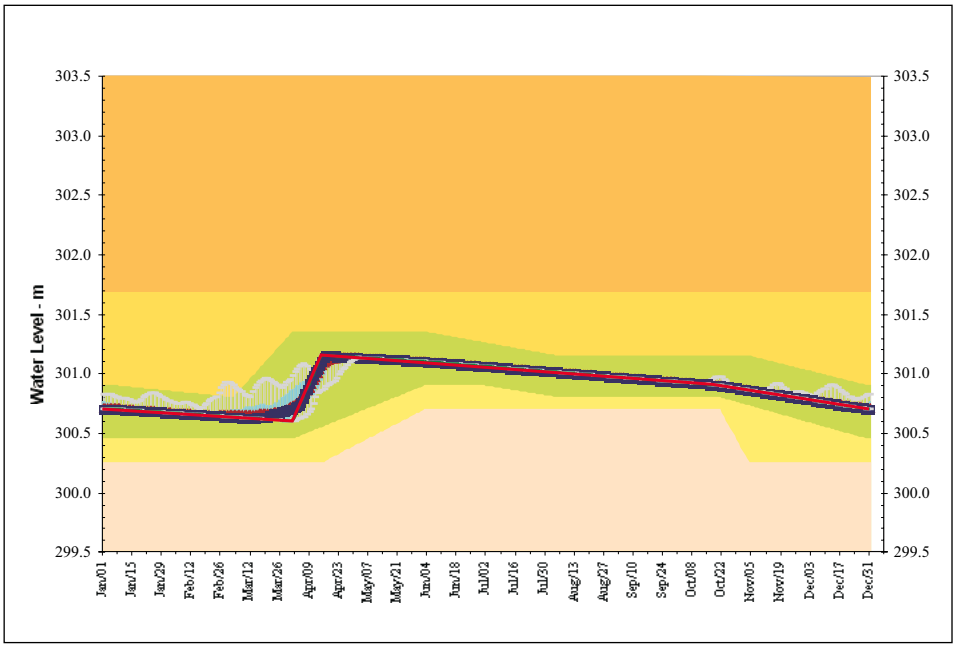
Table 11.3.7
Wood Lake

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	301.35 300.45 – 300.9 301.15 – 301.05 April 16 0.1 Down	301.35 300.45 – 300.9 301.15 – 301.1 April 17 0.05 Down	Same NOZ with same spring peak and gradual decline over the summer to a slightly lower (0.05 m) end of summer elevation.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	301.35 – 301.15 300.9 – 300.8 301.05 – 301.0 0.05 Down	301.35 – 301.15 300.9 – 300.8 301.1 – 300.95 0.15 Down, over summer	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	301.15 – 301.03 300.8 – 300.59 301.0 – 300.82 0.18 Down, proceeds into winter.	301.15 – 301.03 300.8 – 300.59 300.95 – 300.8 0.15 Down, proceeds into winter.	Gradual drawdown through the fall.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	301.03 – 300.8 300.59 – 300.45 300.82 – 300.6 0.22 Down, Oct 15 to March 15	301.03 – 300.8 300.59 – 300.45 300.8 – 300.6 0.2 Down, Oct 15 to March 15	Gradual decline to same winter target elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	None, some leakage 0.16 m^3/s 0.57 m^3/s 0.05 m^3/s 2.59 m^3/s 0.02 m^3/s 0.0 m^3/s	0.1 m^3/s, year round 0.19 m^3/s 0.53 m^3/s 0.11 m^3/s 2.58 m^3/s 0.0 m^3/s 0.0 m^3/s	Consistent summer, fall and winter release to maintain flow and habitat value into the South Branch Muskoka River.

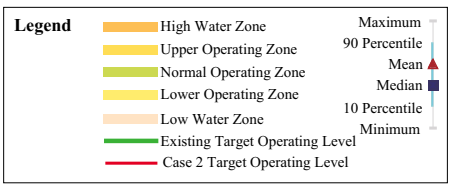
Wood Lake



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.3.7
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Wood Lake

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11.3.8 Matthias Generating Station and Head Pond

The proposed plan is compared to the present operating plan in Table 11.3.8 and Figure 11.3.8. The facility is considered run-of-river, and OPGC has flooding rights within the head pond up to an elevation of 293.5 m. OPGC also has the legal right to develop waterpower at the site, which is a result of the long tenure of waterpower at the site (i.e., prior to March 1911 as defined under the Beds of Navigable Waters Act). The facility has generally remained within the NOZ elevations shown in Figure 11.3.8(a) (292.91 to 292.0 m elevation), and prefers to remain near the top of that zone (to enhance generation capacity). During exceptional circumstances (i.e., when power demand was well above normal) the facility has utilized the full operating band. The absolute operating range for the facility (i.e., which would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 1.8 m (293.5 m elevation to 291.7 m elevation).

The proposed changes reduce the overall operating limits for the facility, and establish new limits that approximate the present NOZ. The revised limits incorporate a higher (than the current NOZ) spring water level for environmental considerations (spring spawning fish and amphibians), a slightly higher (than the current NOZ) upper level the rest of the year to accommodate the historical operational ranges, and an elevated lower limit (higher than their operational lower limit) for social and environmental enhancements. The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in the head ponds in response to energy demands. However, three BMP lines have been established to address specific ecological or social considerations. Adherence to these BMP elevations will be undertaken voluntarily by OPGC when favourable conditions exist (i.e., suitable operational, hydrological and/or environmental conditions). The first BMP (mid March to end of May) was developed to enhance conditions for spring spawning species (fish, amphibians, etc), with the line considered to be similar to the TOL noted above for MNR lakes. The second (June 1 to 15) addresses spawning requirements for centrarchid species (bass, pumpkinseed, etc), with the intention that water levels remain above the noted level during that time

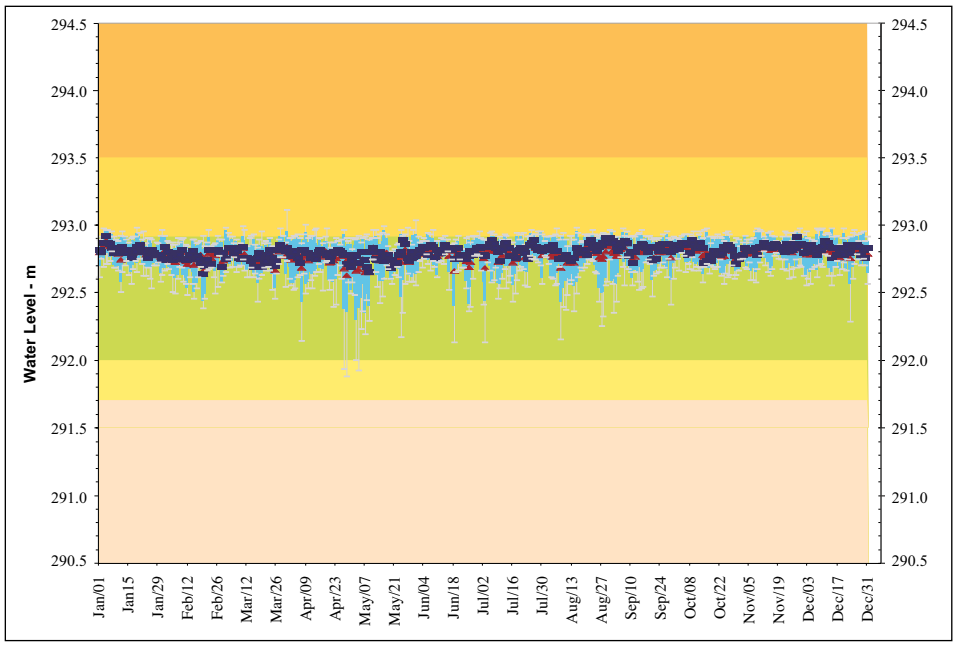
period. The third (mid-June to mid-September) addresses water levels for summer recreational use, with the intention that water levels remain above the noted level during that time period. It is anticipated that more attention to dam operation will be required during the spring to maintain levels in the vicinity of the mid-March to end of May BMP line. At other times of the year, a similar level of dam operation will be required to remain within the proposed NOZ as with the present operating plan.

In addition, OPGC has agreed to provide a minimum outflow of 3 m^3/s through either the generator or spill gates at Matthias GS during the spring walleye spawning period to provide an adequate flow at the South Falls walleye spawning site (in spillway channel, adjacent to powerhouse). MNR will provide a minimum outflow of 5 m^3/s at Baysville to ensure that 3 m^3/s is available at Matthias GS.

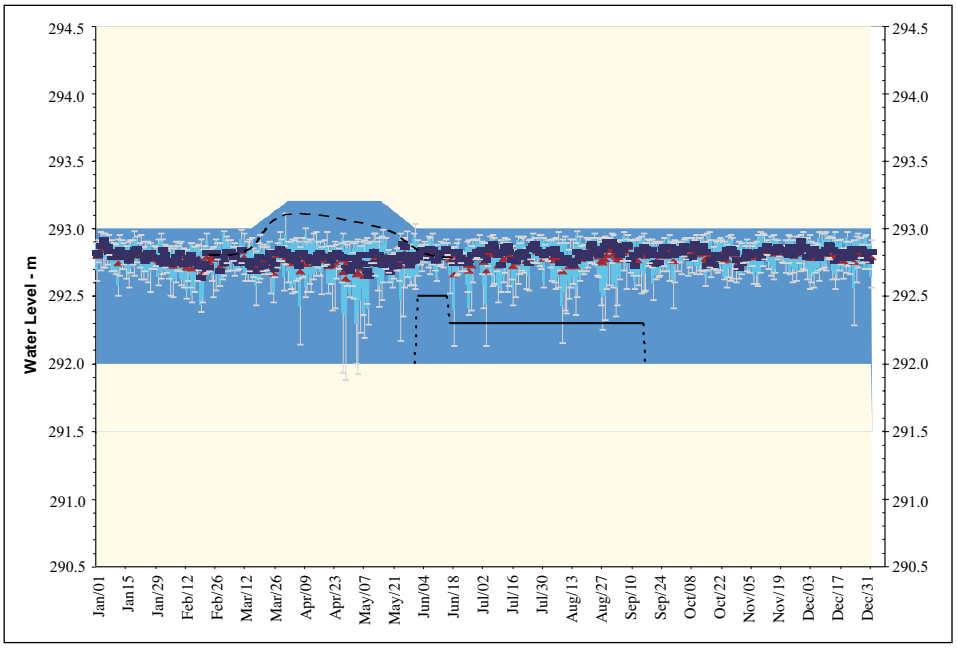
Table 11.3.8
Matthias Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	293.5 292.91 292.0 291.7 None None None	Upper NOZ 293.0 – 293.2 292.0 Lower NOZ None 109.8 3	Historic water level fluctuations were typically 0.5 m on average, although absolute fluctuations could be as much as 1.5 m. The proposed plan provides an operating range of 1.0 to 1.2 m under normal operating conditions. BMPs are provided to enhance ecological and social uses when conditions permit.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	293.5 292.91 292.0 291.7 None None None	Upper NOZ 293.0 292.0 Lower NOZ None 109.8 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	293.5 292.91 292.0 291.7 None None None	Upper NOZ 293.0 292.0 Lower NOZ None 109.8 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	293.5 292.91 292.0 291.7 None None None	Upper NOZ 293.0 292.0 Lower NOZ None 109.8 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	16.43 m^3/s annual average (for power) 7.71 m^3/s 28.88 m^3/s 1.56 m^3/s 90.29 m^3/s 3.22 m^3/s 1.63m^3/s	16.79 m^3/s annual average (for power) 8.84 m^3/s 29.33 m^3/s 3.12 m^3/s 100.32 m^3/s 3.33 m^3/s 3.17 m^3/s	Minimum flow of 3 m^3/s (on hourly basis) from April 15 to June 1 for walleye spawning at South Falls. Consistent summer, fall and winter minimum flow (3 m^3/s) to maintain social and ecological habitat values in the South Branch. Some redistribution of flow from the winter to the summer season to enhance summer base flows.

Matthias GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

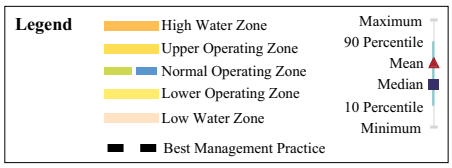


Figure 11.3.8
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Matthias GS

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11.3.9 Trethewey Generating Station and Head Pond

The proposed plan is compared to the present operating plan in the Table 11.3.9 and Figure 11.3.9. The facility is considered run-of-river, and OPG has flooding rights within the head pond up to an elevation of 280.35 m. The facility has generally remained near the middle of the 0.91 m NOZ shown in Figure 11.3.9(a) (279.43 to 278.52 m elevation), and has rarely extended beyond the NOZ levels. The absolute operating range for the facility (i.e., which, if exceeded, would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 1.88 m (279.74 m elevation to 278.06 m elevation).

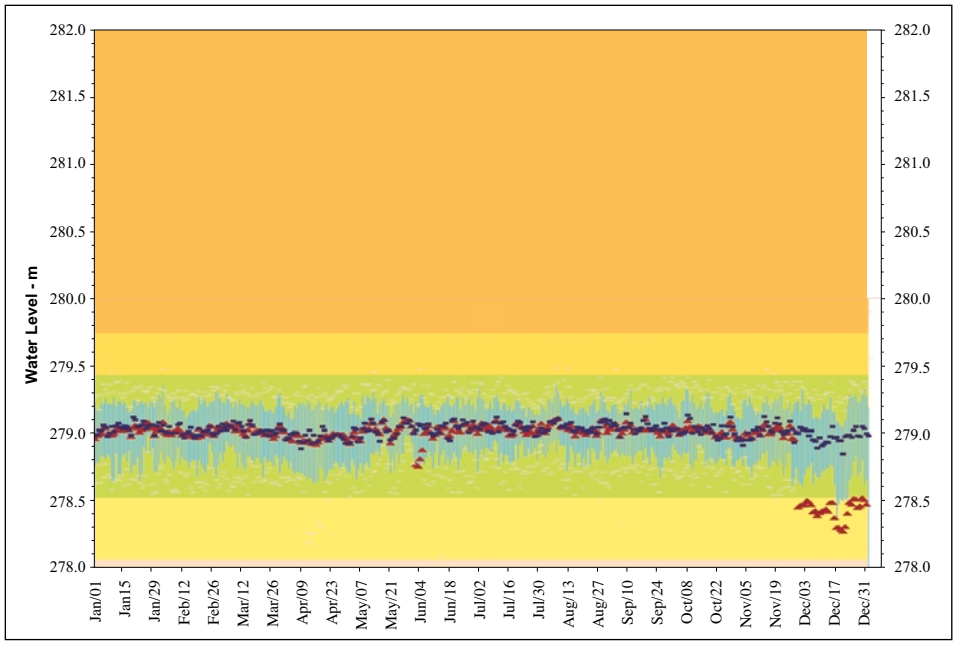
The proposed changes reduce the overall operating limits for the facility, and establish new limits that are the same as the present NOZ. The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in the head ponds in response to energy demands. It is anticipated that a similar number of dam operations will be required to achieve the proposed plan as is required for the present plan.

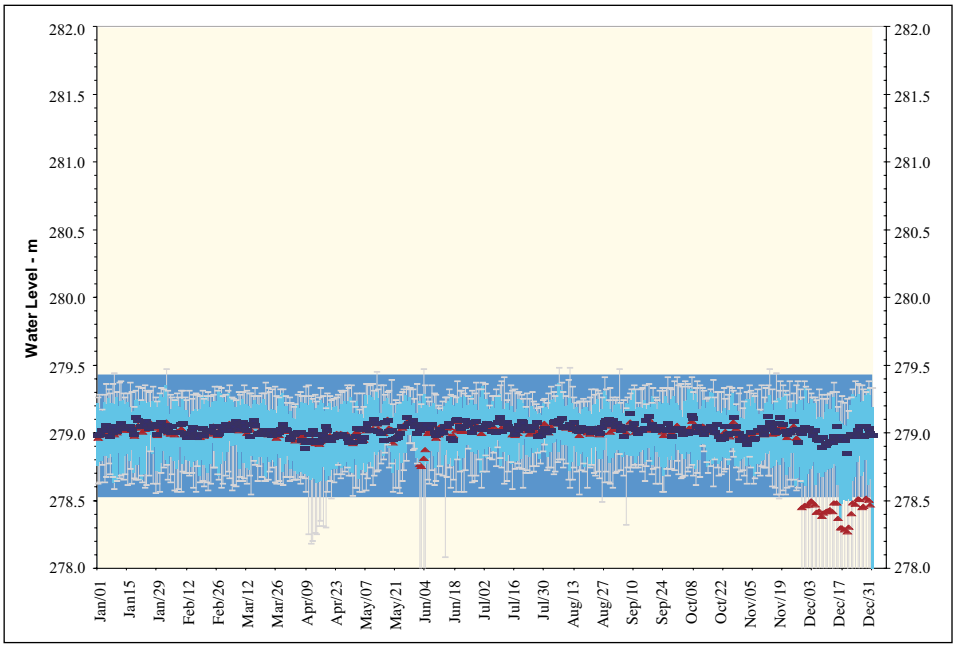
Table 11.3.9
Trethewey Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	279.74 279.43 278.52 278.06 None None None	Upper NOZ 279.43 278.52 Lower NOZ None 110.8 3	Historic water level fluctuations were typically 0.6-0.7 m, although absolute fluctuations could be as much as 1.3 m. The proposed plan provides an operating range of 0.91 m under normal operating conditions.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	279.74 279.43 278.52 278.06 None None None	Upper NOZ 279.43 278.52 Lower NOZ None 110.8 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	279.74 279.43 278.52 278.06 None None None	Upper NOZ 279.43 278.52 Lower NOZ None 110.8 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	279.74 279.43 278.52 278.06 None None None	Upper NOZ 279.43 278.52 Lower NOZ None 110.8 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	13.34 m^3/s annual average (for power) 7.91 m^3/s 29.53 m^3/s 1.57 m^3/s 93.15 m^3/s 3.26 m^3/s 1.66 m^3/s	13.48 m^3/s annual average (for power) 8.88 m^3/s 29.48 m^3/s 3.12 m^3/s 101.38 m^3/s 3.34 m^3/s 3.18 m^3/s	Consistent summer, fall and winter minimum flow (3 m^3/s) to maintain social and ecological habitat values in the South Branch. Some redistribution of flow from the winter to the summer season to enhance summer base flows.

Trethewey GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

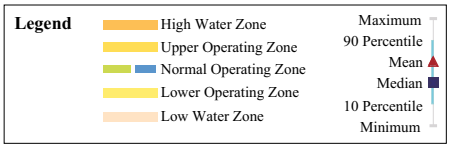


Figure 11.3.9
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Trethewey GS

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11.3.10 Hanna Chute Generating Station and Head Pond

The proposed plan is compared to the present operating plan in the Table 11.3.10 and Figure 11.3.10. The facility is considered run-of-river, and OPG has the flooding rights within the head pond up to an elevation of 269.66 m. The facility has a very narrow NOZ (0.39 m, being from 268.5 to 268.11 m elevation), and generally remained within that narrow band as shown in Figure 11.3.10(a). Water levels do however extend beyond the NOZ elevations during high or low flow events. The absolute operating range for the facility (i.e., which, if exceeded, would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 1.95 m (268.84 m elevation to 266.89 m elevation).

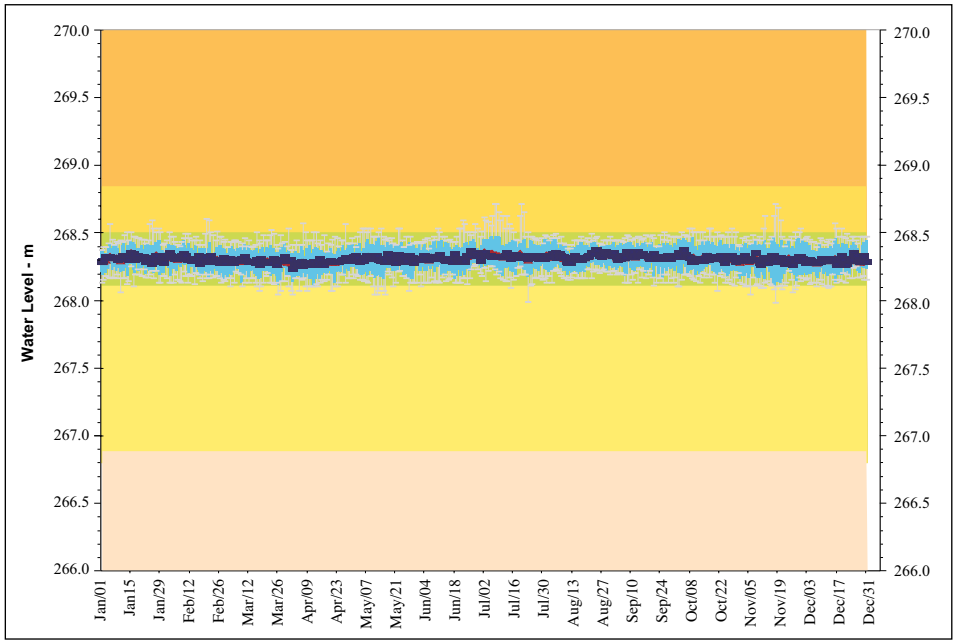
The proposed changes reduce the overall operating limits for the facility, and establish new limits that are slightly larger than the present NOZ. The new NOZ (268.11 to 268.71 m) will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in the head ponds in response to energy demands. It is anticipated that a similar number of dam operations will be required to achieve the proposed plan as is required for the present plan.

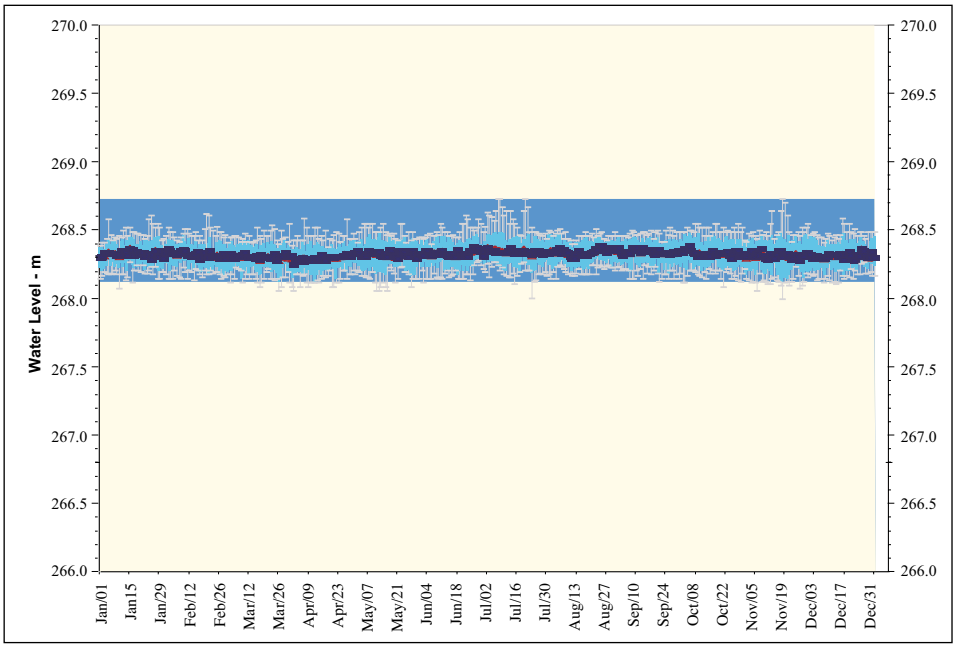
Table 11.3.10
Hanna Chute Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	268.84 268.5 268.11 266.89 None None None	Upper NOZ 268.71 268.11 Lower NOZ None 112.6 3	Historical range typically within the NOZ (0.39m), but did extend beyond the upper and lower levels during exceptional flow events (floods and/or droughts). New operating range would provide a slightly larger NOZ which encompasses the historical range of water level fluctuation.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	268.84 268.5 268.11 266.89 None None None	Upper NOZ 268.71 268.11 Lower NOZ None 112.6 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	268.84 268.5 268.11 266.89 None None None	Upper NOZ 268.71 268.11 Lower NOZ None 112.6 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	268.84 268.5 268.11 266.89 None None None	Upper NOZ 268.71 268.11 Lower NOZ None 112.6 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	14.37 m^3/s annual average (for power) 7.91 m^3/s 29.54 m^3/s 1.57 m^3/s 93.71 m^3/s 3.26 m^3/s 1.66 m^3/s	14.53 m^3/s annual average (for power) 8.99 m^3/s 29.78 m^3/s 3.13 m^3/s 103.44 m^3/s 3.38 m^3/s 3.19 m^3/s	Consistent summer, fall and winter minimum flow (3 m^3/s) to maintain social and ecological habitat values in the South Branch. Some redistribution of flow from the winter to the summer season to enhance summer base flows.

Hanna Chute GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

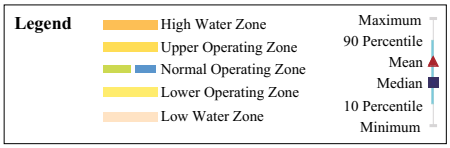


Figure 11.3.10
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Hanna Chute GS

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11.3.11 South Falls Generating Station and Head Pond

The proposed plan is compared to the present operating plan in the Table 11.3.11 and Figure 11.3.11. The facility is considered run-of-river, and OPG has flooding rights within the head pond up to an elevation of 259.75 m. The facility has a NOZ of 0.73 m (259.32 to 258.59 m elevation), and has remained within that band most of the time as shown in Figure 11.3.11(a). Water levels occasionally extend beyond the NOZ elevations during high or low flow events, and the absolute operating range for the facility (i.e., which, if exceeded, would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 1.56 m (259.75 m elevation to 258.19 m elevation).

The proposed changes reduce the overall operating limits for the facility, and establish new limits that are slightly larger than the present NOZ. The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

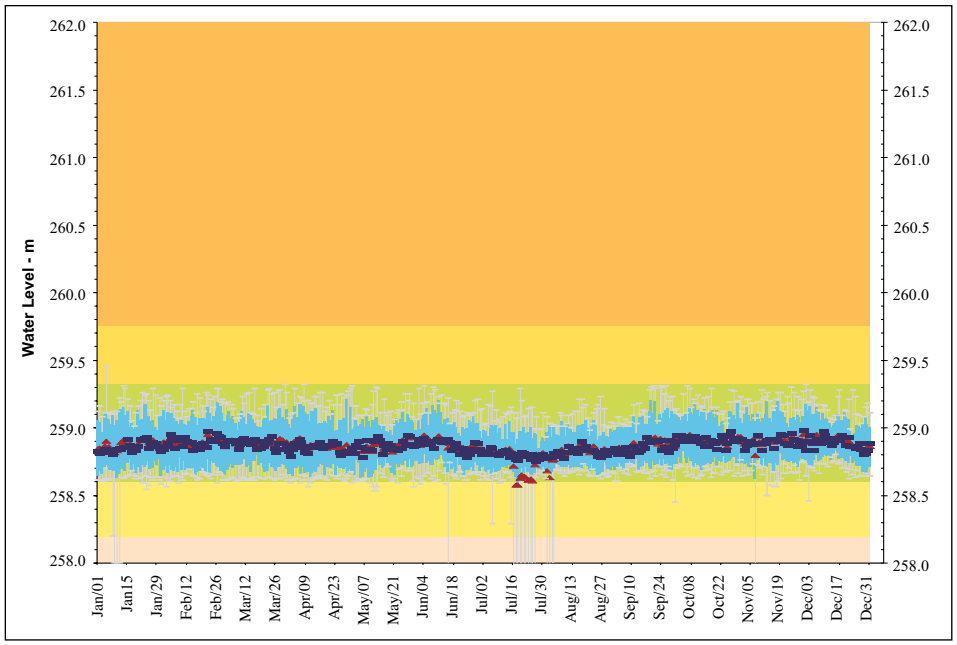
A TOL is not proposed as waterpower operators require flexibility to vary water levels in the head ponds in response to energy demands. It is anticipated that a similar number of dam operations will be required to achieve the proposed plan as is required for the present plan.

In addition, OPG has agreed to provide a minimum outflow of 3 m^3/s through the spillway at South Falls GS during the spring walleye spawning period to provide an adequate flow at the walleye spawning site adjacent to the powerhouse. MNR will provide a minimum outflow of 5 m^3/s at Baysville, and Matthias GS will provide a minimum outflow of 3 m^3/s at Matthias GS to ensure that the required volume is available at South Falls.

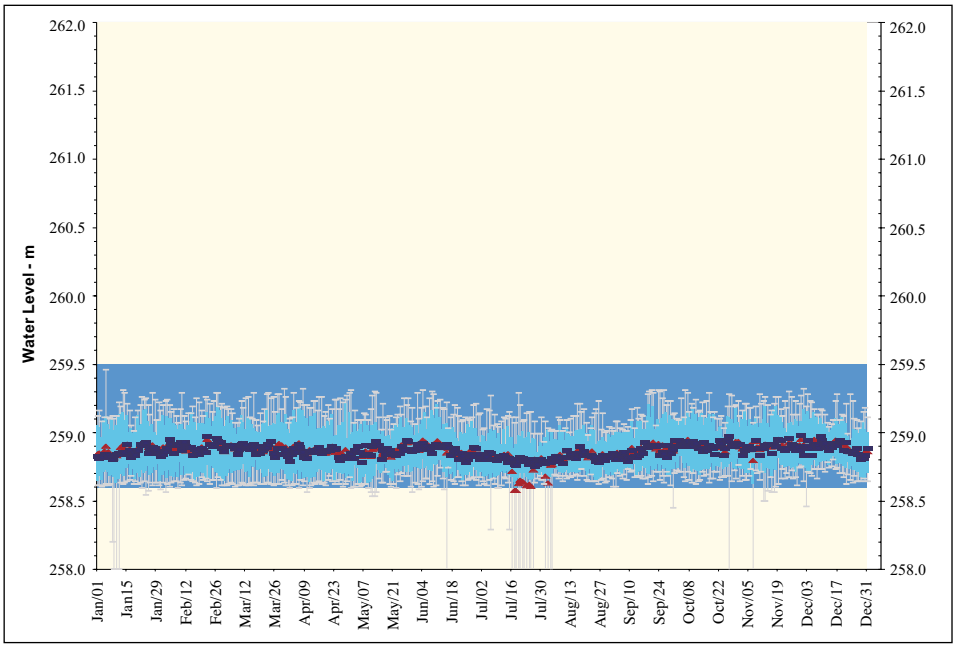
Table 11.3.11
South Falls Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	259.75 259.32 258.59 258.19 None None None	Upper NOZ 259.5 258.59 Lower NOZ None 112.6 3	Historical range typically within the NOZ (0.73m), but did extend beyond the upper and lower levels during exceptional flow events (floods and/or droughts). New operating range would provide a NOZ that encompasses the historical range of water level fluctuation.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	259.75 259.32 258.59 258.19 None None None	Upper NOZ 259.5 258.59 Lower NOZ None 112.6 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	259.75 259.32 258.59 258.19 None None None	Upper NOZ 259.5 258.59 Lower NOZ None 112.6 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	259.75 259.32 258.59 258.19 None None None	Upper NOZ 259.5 258.59 Lower NOZ None 112.6 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	13.26 m^3/s annual average (for power) 7.91 m^3/s 29.54 m^3/s 1.57 m^3/s 93.17 m^3/s 3.26 m^3/s 1.66 m^3/s	13.4 m^3/s annual average (for power) 8.99 m^3/s 29.78 m^3/s 3.13 m^3/s 103.46 m^3/s 3.38 m^3/s 3.19 m^3/s	Minimum flow of 3 m^3/s (on an hourly basis) provided through the spillway channel from April 15 to June 1(or as requested by MNR) to maintain walleye spawning site adjacent to the South Falls powerhouse. Consistent summer, fall and winter minimum flow (3 m^3/s) to maintain social and ecological habitat values in the South Branch. Some redistribution of flow from winter to summer season to enhance summer base flows.

South Falls GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

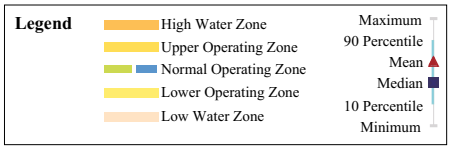


Figure 11.3.11
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - South Falls GS

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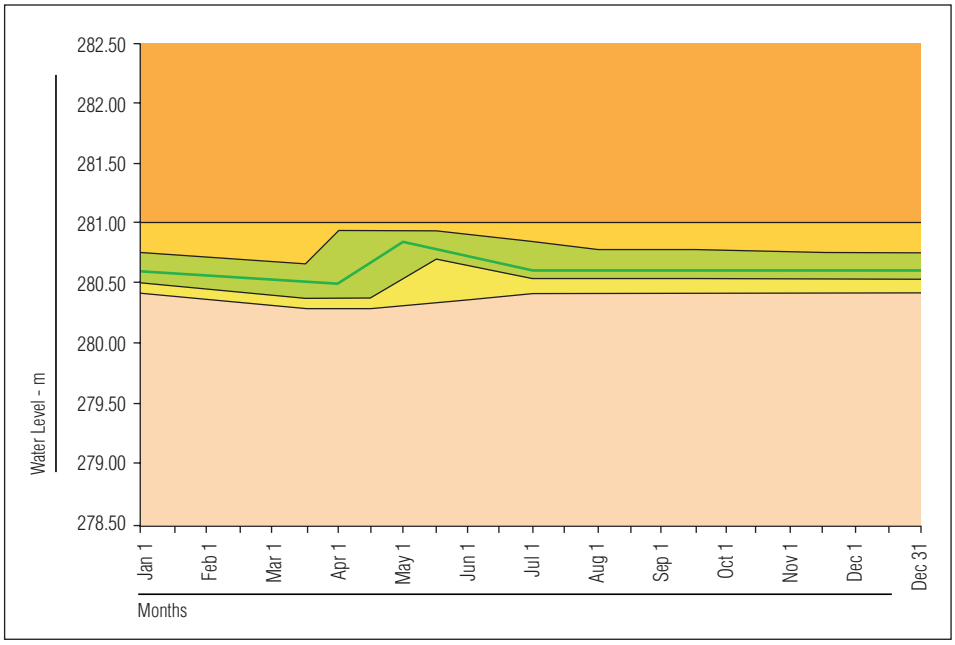
11.4 Lower Watershed

11.4.1 Skeleton Lake

The dam at the outlet from Skeleton Lake was replaced in 2001 with an overflow weir that has limited ability to influence lake water levels. The hydrologic regime arising from the weir is very similar to one that would arise under natural conditions (i.e., if there was no control at the outlet), therefore no changes from the present rule curve are proposed. MNR is presently consulting with lake stakeholders and reviewing dam operations to determine whether the weir meets the objectives for water management for the lake. Table 11.4.1 and Figure 11.4.1 provide the existing conditions.

Table 11.4.1 Skeleton Lake			
Component	**Operating Characteristics**	**Present Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	280.90 280.65 – 280.4 270.75 – 280.5 0.25 Down	Flood damage zone starts at 281.0 m on lake.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	280.87 – 280.75 280.68 – 280.5 280.7 – 280.6 0.1 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	280.75 280.50 280.60 0	
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	280.75 – 280.65 280.5 – 280.4 280.6 – 280.5 0.1 Down	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release	0.4 m^3/s summer, reduced to 0.2 m^3/s during drought conditions. Spring outflow below 3.8 m^3/s to minimize downstream flooding.	Minimum flow provided to maintain downstream water quality

Skeleton Lake



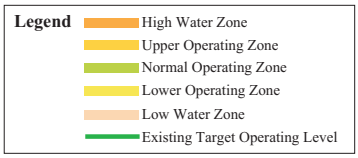


Figure 11.4.1
Muskoka River Water Management Plan
Present Operating Strategy - Skeleton Lake

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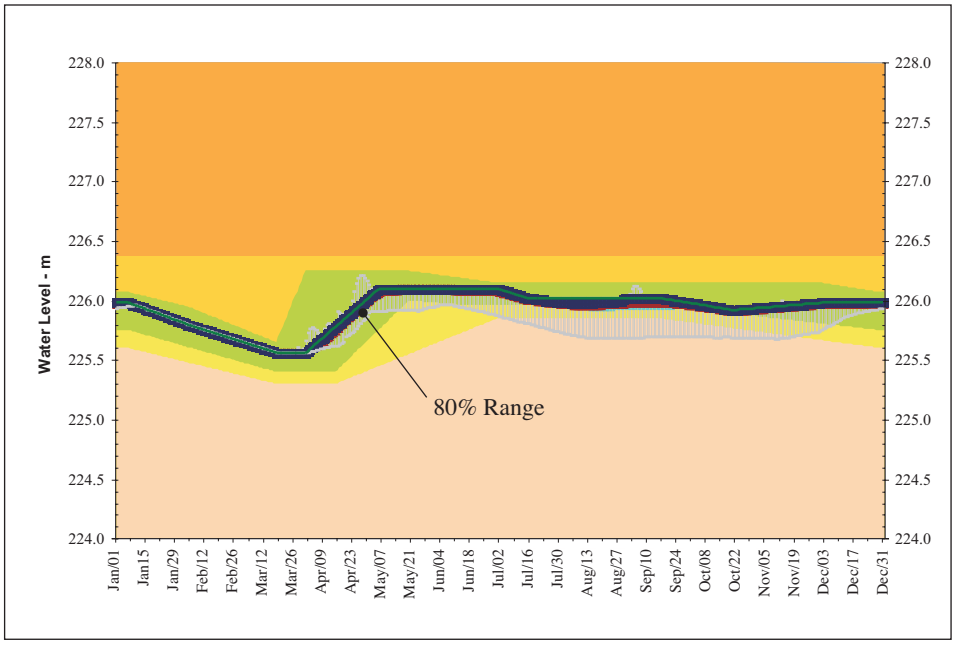
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11.4.2 Lakes Rosseau and Joseph

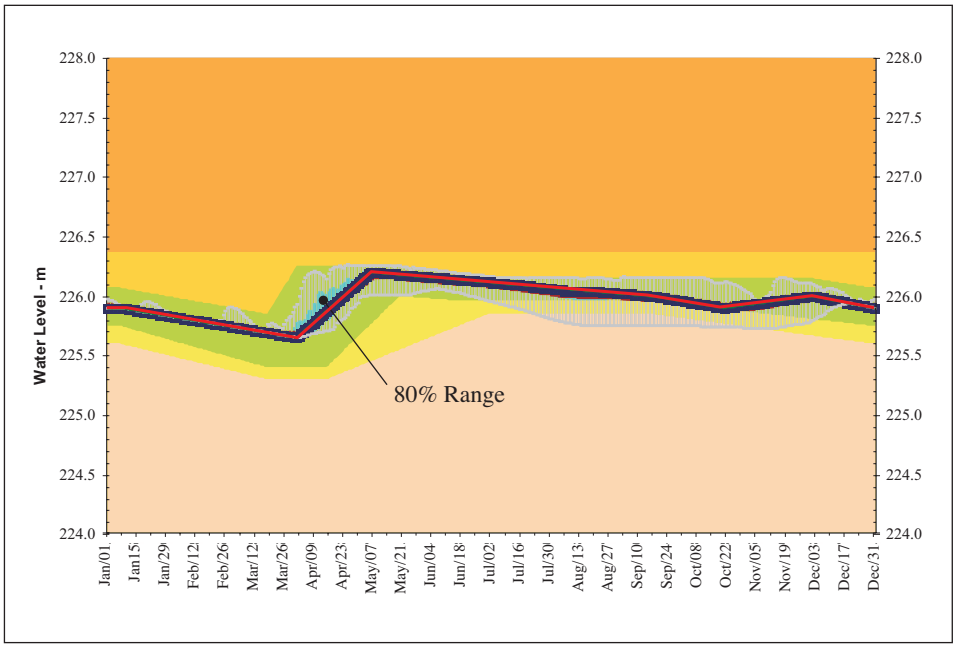
The proposed plan is compared to the present operating plan in Table 11.4.2 and Figure 11.4.2. The proposed changes for this lake were accommodated within the limits of the present NOZ. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

Table 11.4.2 Lakes Rosseau and Joseph				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	226.25 225.4 – 226.0 226.12 – 226.1 May 7 0.02 Down	226.25 225.4 – 226.0 226.2 – 226.15 May 7 0.05 Down	A slightly higher (0.08 m) target spring water level, followed by a gradual summer drawdown to a similar end of summer target elevation.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	226.25 – 226.15 226.0 – 225.96 226.1 – 226.02 0.08 Down	226.25 – 226.15 226.0 – 225.96 226.15 – 226.0 0.15 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	226.15 225.96 – 225.8 226.02 – 225.92 0.1 Down, then natural rise to 225.98	226.15 225.96 – 225.8 226.0 – 225.9 0.1 Down, then natural rise to 226.0	Similar fall drawdown on October 15 for lake trout spawning, followed by a natural rise to the same December 1 elevation prior to the winter drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	226.15 – 225.65 225.8 – 225.4 225.98 – 225.46 0.52 Down	226.15 – 225.65 225.8 – 225.4 226.0 – 225.65 0.35 Down	Slow decline in over-winter level to a 0.19 m higher target winter elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	0.7 m^3/s summer, 0.52 m, Dec 1 to Mar 15 4.22 m^3/s 13.94 m^3/s 0.53 m^3/s 83.08 m^3/s 0.45 m^3/s 0.45 m^3/s	1 m^3/s summer, 0.35 m, Dec 1 to Mar 15 5.56 m^3/s 12.03 m^3/s 1.05 m^3/s 64.8 m^3/s 0.7 m^3/s 0.7 m^3/s	Slightly higher summer outflow, lower winter outflow, and marginally more base flow.

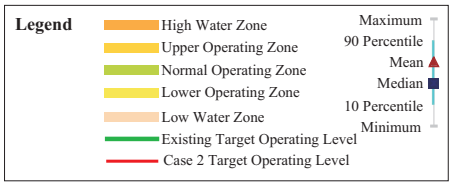
Lakes Rosseau & Joseph



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.4.2
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Lakes Rosseau and Joseph

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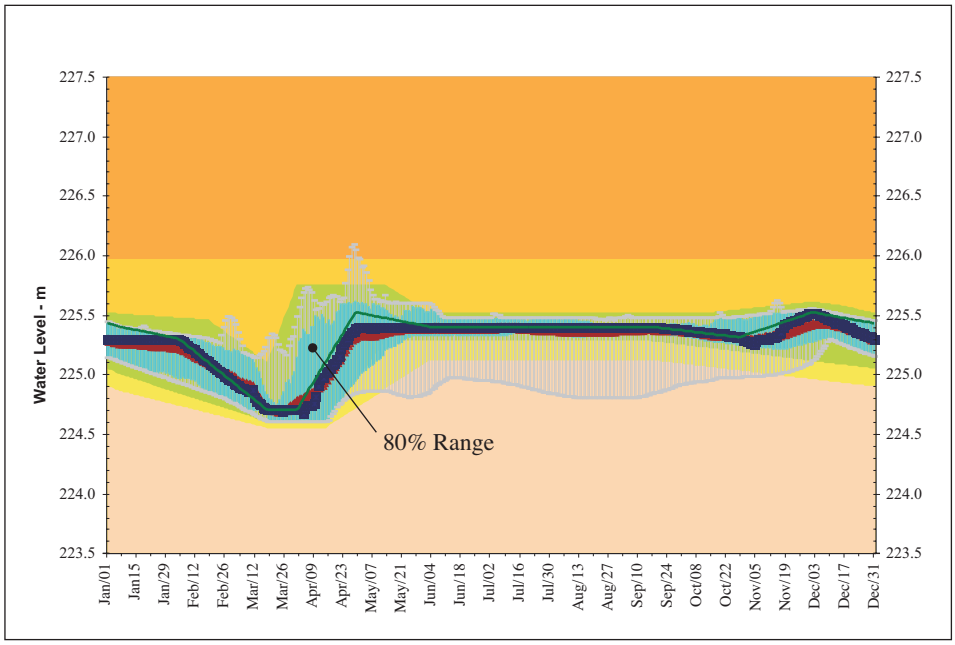
11.4.3 Lake Muskoka

The proposed plan is compared to the present operating plan in Table 11.4.3 and Figure 11.4.3. The proposed plan decreases the extent of the TOL, as well as the lower limit of the NOZ for the fall period. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

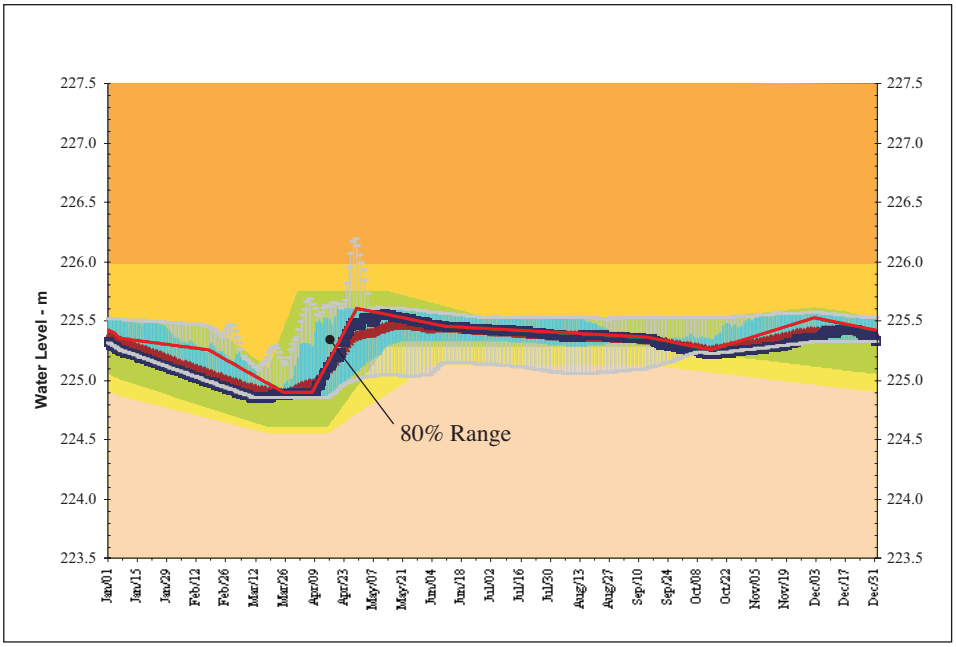
Table 11.4.3
Lake Muskoka

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	225.75 224.6 – 225.28 225.52 – 225.4 April 29 0.12 Down	225.75 224.6 – 225.28 225.6 – 225.48 May 1 0.12 Down	A slightly higher spring high water level, followed by a gradual summer drawdown to a target elevation approximately 0.05 m lower.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	225.75 – 225.52 225.28 225.4 0 -	225.75 – 225.52 225.28 225.48 – 225.35 0.13 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.52 – 225.61 225.28 – 225.12 225.4 – 225.31 0.09 Down, then natural rise to 225.52 by Dec 1	225.52 – 225.61 225.28 – 225.12 225.35 – 225.25 0.1 Down, then natural rise to 225.52 by Dec 1	Drawdown to 0.06 m lower October 15 level for lake trout spawning; followed by a natural rise to the same December 1 elevation prior to the winter drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.61 – 225.1 225.12 – 224.6 225.52 – 224.7 0.82 Down	225.61 – 225.1 225.12 – 224.6 225.52 – 224.9 0.62 Down	Slow decline in over-winter level to slightly higher (0.2 m) winter target elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	6 m^3/s summer, 0.82 m, Dec 1 to Mar 15 29.66 m^3/s 84.84 m^3/s 7.34 m^3/s 299.79 m^3/s 5.0 m^3/s 3.0 m^3/s	6 m^3/s summer, 0.62 m, Dec 1 to Mar 15 31.25 m^3/s 88.08 m^3/s 10.16 m^3/s 309.57 m^3/s 7.78 m^3/s 3.0 m^3/s	Higher summer flow, slightly more fall drawdown (September 15 to October 15) and less winter drawdown.

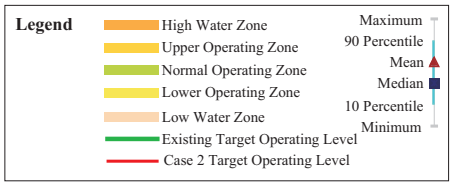
Lake Muskoka / Burgess GS



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.4.3
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Lake Muskoka

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11.4.4 Burgess Generating Station

No changes are proposed to the operating plan for this facility. The facility is located on Lake Muskoka adjacent to the MNR controlled Bala North and Bala South dams, and provides a flow of 0.5 to 4 m^3/s into Bala Reach. The facility is advised (by MNR) when there is sufficient water to operate, and when it must shut down (typically when both Bala North and Bala South dams are closed and water levels on Lake Muskoka are falling below the NOZ). The facility will cease operations within 24 hrs of the notification by MNR to shut down.

The upper and lower limits are typically the NOZ of Lake Muskoka, but these are not a compliance zone for the facility. As outflow from Lake Muskoka increases, flow is sequentially allocated to Burgess GS, then Bala South and lastly Bala North dam. Under declining flows, the priority of flow sequence is reversed.

Burgess Generating Station				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date*	225.75 224.6 – 225.28	225.75 224.6 – 225.28	Operating range is the same as that of Lake Muskoka. No change is proposed. Facility will shut down at MNR's request if insufficient flow is available in the system.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	225.75 – 225.52 225.28	225.75 – 225.52 225.28	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.52 – 225.61 225.28 – 225.12	225.52 – 225.61 225.28 – 225.12	
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.61 – 225.1 225.12 – 224.6	225.61 – 225.1 225.12 – 224.6	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.23 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.62 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	Consistent spring, summer, fall and winter flow when Lake Muskoka water levels are within the desired levels. During low flow periods, Burgess GS will be shut down (as per MNR's request) to allow MNR to assume control of Lake Muskoka levels and outflows.

11.4.5 Bala Reach, Ragged Rapids GS and Moon Dam

The proposed operating plan for Bala Reach is presented in Table 11.4.4 and Figure 11.4.4. Levels on Bala Reach are affected by both the operation of the upstream Bala dams, and the operation of the downstream waterpower facility (Ragged Rapids) and control dam (Moon Dam). Water level management is further complicated by the action of Moon Chutes (a natural constriction at the downstream end of Bala Reach) which restricts water passage out of Bala Reach at river flows above approximately 85 m^3/s. Water level management in Bala Reach is a joint effort between SREL and OPG, as SREL controls input into the reach, while the Moon Chutes and OPG control outflow from the reach.

During high flow events (>100 m^3/s), high water levels are a common occurrence in Bala Reach due to the constriction at Moon Chutes. Under these conditions, water levels in Bala Reach are typically inversely correlated with Ragged Rapids water levels, as the Moon Dam is opened to pass excess flow down the Moon River (see Figures 11.4.4a and b). This in turn lowers the Ragged Rapids head-pond level, although the constriction at Moon Chutes reduces the effectiveness of these actions as flows progressively exceed 85 m^3/s. Low levels at Ragged Rapids are utilized to "draw" water through the Moon Chutes, in order to achieve lower water levels in Bala Reach.

The present operational regime for Bala Reach includes a TOL band, a NOZ and Upper and Lower Operating Zones (see Figure 11.4.4a). The summer TOL band was revised in 2003 as a result of discussions between OPG and the Moon River Cottage Owners Association. As a result, the summer (June 1 to October 15) TOL is from 219.0 to 219.3 m, while the fall, winter and spring (June 16 to May 30) TOL remained from 219.2 to 219.5 m. The NOZ extends upward to 219.6 m during the summer period, and to 220.38 m during the remainder of the year.

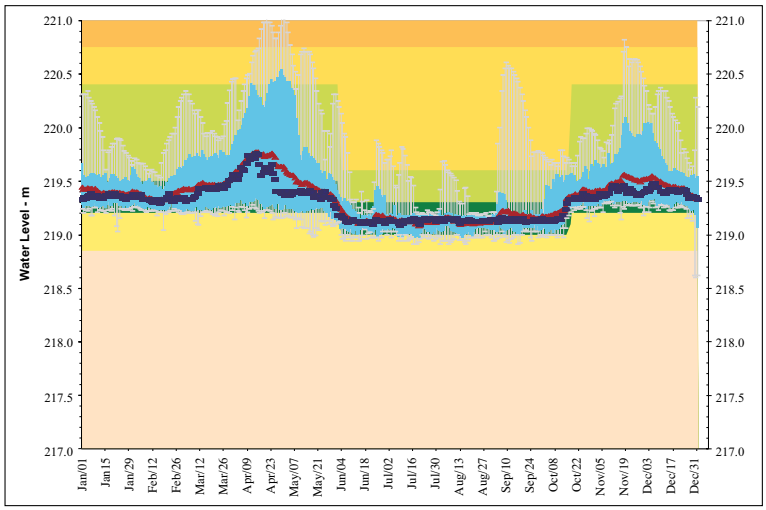
The Bala Reach TOL band (219.0 to 219.3 m from June 1 to October 15, and 219.2 to 219.5 m during the remainder of the year) will become the compliance zone (see Section 13 for definition of compliance) for the Ragged Rapids and Moon Dam facilities, and will create legally enforceable upper and lower limits during normal operating conditions.

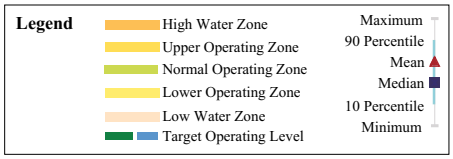
Due to the need to utilize the Ragged Rapid GS and Moon Dam to maintain Bala Reach water levels within the TOL during normal hydrologic conditions, and to try to reduce water levels in Bala Reach during extreme flow events (i.e., >85 m^3/s), no compliance zone is established for the Ragged Rapids head pond. The current operating zones for the Ragged Rapids head pond will be maintained by OPG for information, and to assist with their day-to-day operations. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

Table 11.4.4
Bala Reach, Ragged Rapids Generating Station and Moon Dam

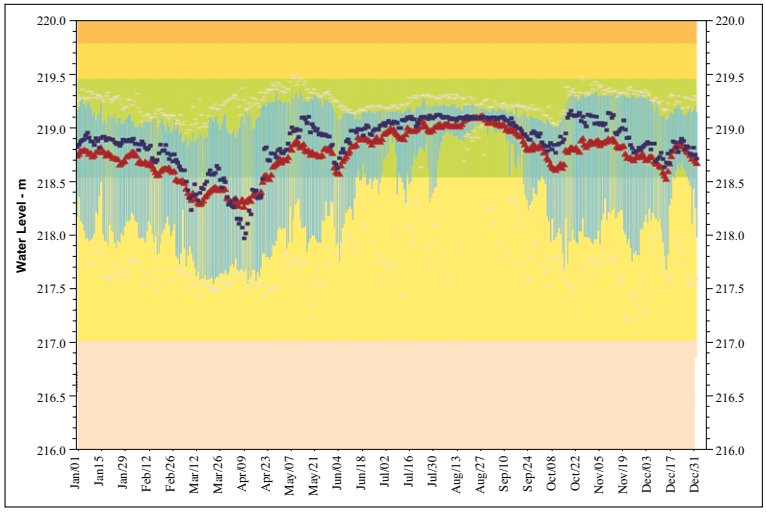
Component	Operating Characteristics (Bala Reach)	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	Ragged Rapids head pond is actively used to decrease Bala Reach water levels during high flow conditions. The previous TOL band will become the compliance zone for the facility, in conjunction with a HFT that takes into account the action of Moon Chutes on flows and levels.
Summer Water Level (June 1 to Oct 15)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 219.6 219.3 219.0 219.0 218.85 None None	Upper TOL Upper TOL 219.3 219.0 Lower TOL Lower TOL 85 6	
Fall Water Level (Oct 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	
Downstream River Reach and Lake Outflow Characteristics below Ragged Rapids	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	53.9 m^3/s annual average (for power) 27.66 m^3/s 81.41 m^3/s 0 m^3/s 92.23 m^3/s 5.03 m^3/s 0 m^3/s	54.18 m^3/s annual average (for power) 31.34 m^3/s 84.79 m^3/s 0 m^3/s 88.88 m^3/s 5.73 m^3/s 0 m^3/s	A minimum target flow of 14 m^3/s will be provided as a best management practice from April 15 to June 1 for walleye spawning at Moon Falls when flows exceed 20 m^3/s or greater. When 20 m^3/s cannot be sustained, flows may be reduced to 8 to 10 m^3/s on the Moon River and 4 to 6 m^3/s on the Musquash River. An adaptive management approach will be followed to provide a flow regime that addresses spring walleye spawning issues and Moon River habitat during other parts of the year.

Bala Reach and Ragged Rapids

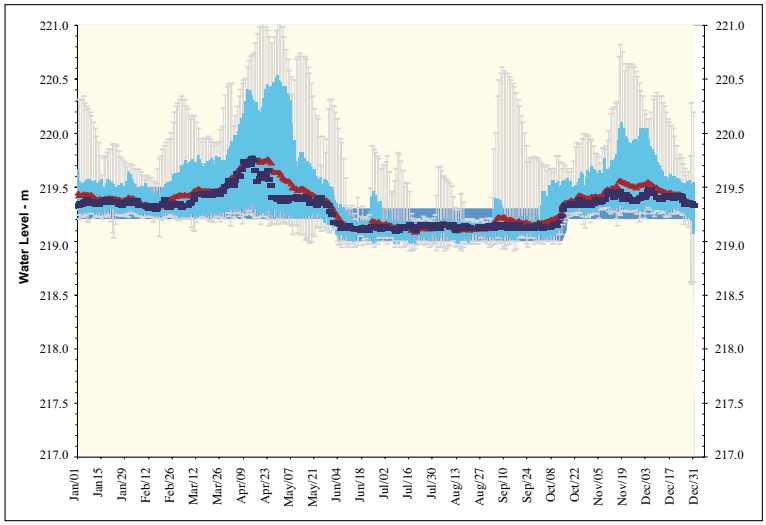




a) Existing Operating Plan and Historical Water Level Statistics - Bala Reach



b) Existing Operating Plan and Historical Water Level Statistics - Ragged Rapids



c) Proposed Operating Plan and Historical Water Level Statistics - Bala Reach

Figure 11.4.4
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Bala Reach and Ragged Rapids

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11.4.6 Big Eddy Generating Station and Head Pond

The proposed plan is compared to the present operating plan in Table 11.4.5 and Figure 11.4.5. The facility is considered run-of-river, and OPG has the flooding rights within the head pond to an elevation of 208.03 m. The facility has typically operates near the upper end of the NOZ, and often exceeds those elevations during high flow periods as shown in Figure 11.4.5a. The absolute operating range for the facility (i.e., which would either result in flooding of facilities or insufficient water to operate the generator) spans a distance of 1.47 m (207.82 m elevation to 206.35 m elevation).

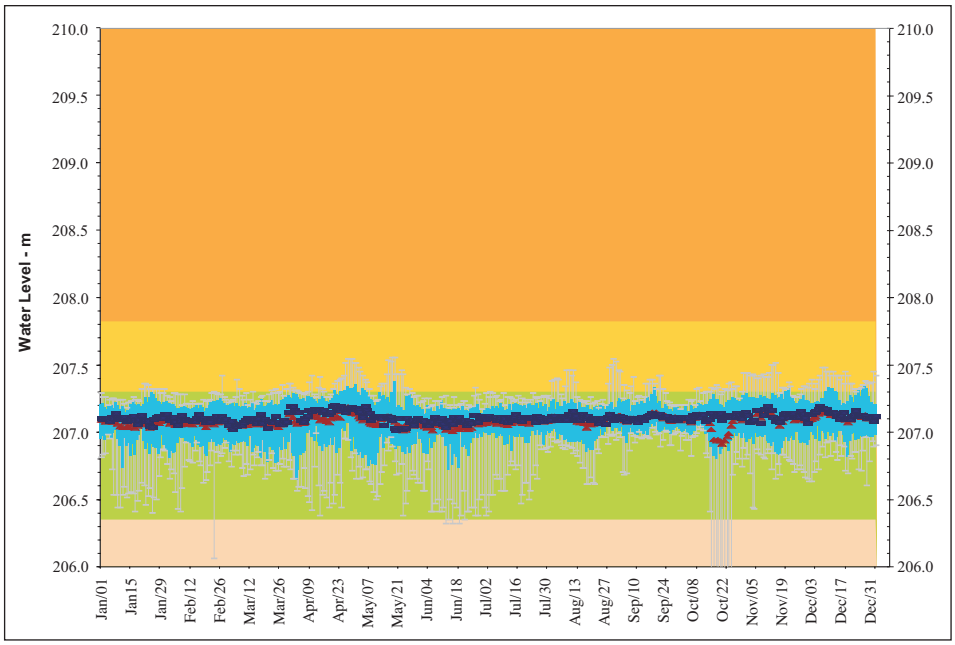
The proposed changes reduce the overall operating limits for the facility, and establish new limits that are equal to the present NOZ. The new NOZ will be considered the compliance zone for the facility (see Section 13 for definition of compliance) and will create legally enforceable upper and lower limits during normal operating conditions.

A TOL is not proposed as waterpower operators require flexibility to vary water levels in the head ponds in response to energy demands. It is anticipated that a similar number of dam operations will be required to achieve the proposed plan as is required for the present plan.

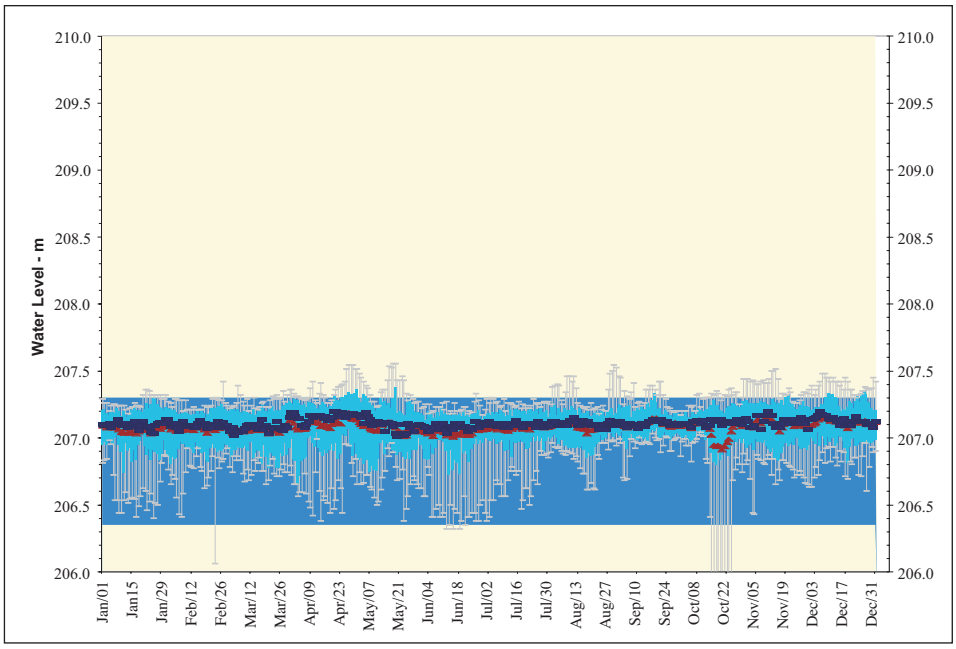
Table 11.4.5
Big Eddy Generating Station and Head Pond

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	207.82 207.3 206.35 206.35 None None None	Upper NOZ 207.3 206.35 Lower NOZ None 85 3	Typical historical range 0.95 m but did extend beyond the upper and lower levels during exceptional flow events (floods and/or droughts). New operating range would fix the upper and lower limits at the present NOZ.
Summer Water Level (June 1 to Sept 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	207.82 207.3 206.35 206.35 None None None	Upper NOZ 207.3 206.35 Lower NOZ None 85 3	
Fall Water Level (Sept 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	207.82 207.3 206.35 206.35 None None None	Upper NOZ 207.3 206.35 Lower NOZ None 85 3	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Lower NOZ (m) Lower Limit (m) TOL (m) HFT (m^3/s) LFT (m^3/s)	207.82 207.3 206.35 206.35 None None None	Upper NOZ 207.3 206.35 Lower NOZ None 85 3	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	54.14 m^3/s annual average (for power) 27.76 m^3/s 81.73 m^3/s 0.03 m^3/s 93.6 m^3/s 5.05 m^3/s 0.16 m^3/s	54.45 m^3/s annual average (for power) 31.41 m^3/s 85.8 m^3/s 0.03 m^3/s 90.29 m^3/s 5.83 m^3/s 0.19 m^3/s	Water level fluctuations in Go Home Lake resulting from Big Eddy flow releases to be addressed by installation of automated flap gate in Go Home Lake dam.

Big Eddy GS



a) Existing Operating Plan and Historical Water Level Statistics



b) Proposed Operating Plan and Historical Water Level Statistics

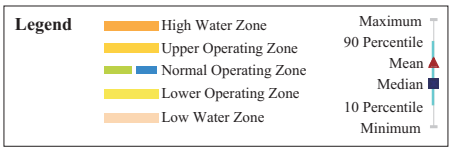


Figure 11.4.5
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Big Eddy GS

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11.4.7 Go Home Lake

No changes to the operation of Go Home Lake dam are proposed as part of this WMP. A remotely operated sluice gate is to be installed in the Go Home Lake dam to address short-term water level fluctuations in the lake as a result of upstream waterpower operations. Sensors will be used to monitor lake levels and activate gate operations accordingly so as to mitigate large water level changes. Table 11.4.6 and Figure 11.4.6 provide the existing operating conditions for the lake. Comments from the Go Home Lake Cottage Owners Association in the Draft Plan are also provided in Table 11.4.6.

Table 11.4.6 Go Home Lake			
Component	**Operating Characteristics**	**Present Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	185.05 – 185.4 184.43 – 184.93 184.63 – 185.24 0.61 Up	Flood damage zone starts at 281.0 m on lake.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	185.3 185.05 185.18 0 -	Remotely operated gate proposed to reduce short-term lake level fluctuations.
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	185.3 185.05 – 184.87 185.18 0 -	
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	185.2 – 184.7 184.78 – 184.3 184.8 – 184.4 0.4 Down	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release - Control Dam - Filter Dam	 As required to match OPG facility outflows. 1.4 m^3/s seepage through dam	
Draft Plan Comments			
Water Levels and Dam Operation	"…appear that the operating plan proposed will have little effect on Go Home Lake." "…recognize that the improved regulation of flows upstream may in fact help reduce the fluctuations in water levels that we experience. The draft plan identifies the proposed automation of one sluiceway, at the outfall of our lake, but does not include the fact that the Ministry does not have the funds to proceed with this work and are currently reevaluating this project. We ask that more emphasis be put on the need for this improvement in the plan so that this project may proceed in the near future." "This dam is part of the Muskoka River system and therefore should be entrenched in the overall plan."		MNR and industry partners in the WMP welcome the comments of the Go Home Lake Cottage Owners Association and will keep them apprised of progress toward the installation of a remotely operated gate at the Go Home Lake control dam.

Insert Figure 11.4.6