5 Water Control Structures and Water Power Facilities

This section describes the water control structures on the Muskoka River system and the existing operating regimes. Changes proposed as part of the WMP are presented in Sections 11 and 12.

5.1 Introduction

5.1.1 Water Control Structures

There are 42 different control dams and spill structures within the Muskoka River watershed that are used to control and maintain water levels of the lakes and river reaches throughout the basin (Figures 5.1a, b and c[*]). Of these structures, 11 are associated with power facilities, while 29 are owned and operated by MNR. The District of Muskoka owns and operates one while the remaining one is privately owned/operated. A listing of the dams, including a summary of their physical features is given in Tables 5.1(a) and 5.1(b), while the interrelationship of these structures is shown schematically in Figure 5.2. Table 5.2 provides further information regarding the physical characteristics of the dams/facilities and present flow and operating constraints.

5.1.2 Current Water Management

The basis for all current water management in the Muskoka River watershed is the Hackner-Holden Agreement. While the original 1940 agreement focused primarily on lake regulation for waterpower production, the 1969 Addendum took the needs of recreational users, fisheries and flood control into account in the establishment of the "rule curves"[**] for the main storage lakes within the system. While that document continues to be the basis for operation of the structures within the system, a number of other water management goals (i.e., to enhance fish spawning opportunities in specific river reaches) have been integrated into the operational procedures over the years to create a more ecosystem-based approach to water management within the Muskoka River system. Typical operational strategies are shown in Figures 5.3 and 5.4 for watershed lakes and river reaches.

[*] All figures and tables are placed at the end of this section.

[**] Rule curves were used to define operating limits and to establish water level curves for specific periods of the year. Under the new plan, the operating limits will be defined as the 'operating plan' and will establish Target, Normal and High and Low Water Operating Levels.

MNR's Dam Operation Manual (MNR, 1997) provides dam operators with specific instructions on how/when the stop logs/valves in the MNR controlled dams must be operated in order to meet the lake water level limits and downstream flow requirements throughout the watershed. Tables and charts denote flow passage capability at specific stop-log settings and water levels, and provide passage time from structure to structure within the watershed. By strategically controlling stop logs and valves, the dams can normally be utilized to maintain water levels within the operating limits for each lake (see Figure 5.3). All dams in the system are manually operated (i.e., personnel must make the required adjustments). It must be stressed that coordination of dam operations between locations within the watershed, and operator experience and judgment are extremely important factors in ensuring that the anticipated lake levels and river flows are achieved.

Dams operated by waterpower companies are all located in riverine sections of the watershed (i.e., none at the outlets of natural lakes, with the exception of Burgess GS) and have their own operational plans and strategies. While each facility has its own operational limits, these facilities are considered 'run-of-the-river' as they have a limited water storage capability and limited ability to influence river flows. Most importantly, the operation of these facilities is coordinated with the operation of the MNR controlled structures to ensure that appropriate flow conditions are maintained.

As a general principle, dam operations should be undertaken during weekdays in order to duce weekend water level fluctuations and associated 'out of compliance' issues for MNR and water power producers. MNR and industry will communicate and cooperate to achieve this objective.

The following sections provide brief descriptions of each dam on the Muskoka River, organized by subwatershed, indicate the purposes currently served by that dam as denoted by the "Dam Operation Manual" (MNR, 1997) and the strategies that are utilized to control flows and water levels within the system.

5.2 North Branch Structures and Current Operating Strategies

There are 16 water control structures on the North Branch of the Muskoka River and its tributaries. Of these, 11 are owned and operated by MNR, 3 are owned and operated by Bracebridge Generation Limited, one is owned by the District Municipality of Muskoka and one is privately owned. The operation of the dams at West Harry Lake, Clearwater Lake, Distress Lake, Axe Lake and Divine Lake dams will not be changing and were not considered further in the WMP. The location, key characteristics and a photo of each structure are also provided in Figure 5.1a.

West Harry Lake Dam



Watershed Location - This MNR dam is located at the outlet of West Harry Lake, in the headwaters of the Big East River within the boundaries of Algonquin Provincial Park. Outflow from the dam discharges into the Big East River, which is joined by McCraney Creek approximately 7.3 km downstream. It controls a drainage area of 36.9 km^2. The upstream lake has a surface area of 1.52 km^2.

Structural Characteristics - The timber dam, originally constructed in 1949 and reconstructed in 1974, is approximately 15 m long, 3 m high, and equipped with a 0.91 m diameter slide control valve. The spillway crest elevation is 31.8 m LCD

Operational Characteristics - The valve was historically used to undertake a drawdown of the lake of approximately 1 m in the fall to augment summer flows in the Big East River. This drawdown was discontinued in 1993.

Goal/Purpose of Dam Operation

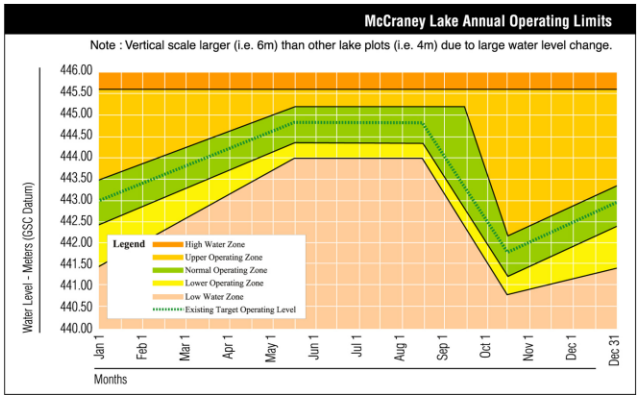
Water levels are maintained within the lake for recreational purposes (canoeing, fisheries, etc).

McCraney Lake Dam



Watershed Location - This MNR dam is located in Algonquin Park at the outlet of McCraney Lake and controls a drainage area of 44.3 km^2. The lake has a surface area of 4.4 km^2. Outflow from the dam flows into McCraney Creek, which joins the Big East River approximately 2.7 km downstream from the dam.

Structural Characteristics - The concrete dam is approximately 6 m high and 12 m long, and contains a 7.6-m wide overflow spillway, one 4.3-m wide sluiceway structure (not operated) and an operational slide valve (0.76 m in diameter). The sill elevation is 440.0 m and the crest elevation of the spillway wall is 444.85 m GSC. The dam contains a maximum of 16 stop logs and retains 4.9 m of water (at the dam face) under normal summer conditions.



Operational Characteristics - The operational characteristics are shown in the figure. The summer water level is maintained at a target operating level of 444.85 m (the crest of the wingwall). The slide valve is open between mid-August and mid-October to release 2 to 3 m^3/s to augment downstream flows on the Big East River. This release results in a 3-m drawdown of the lake. The lake refills on its own after the valve is closed in mid-October.

Goal/Purpose of Dam Operation

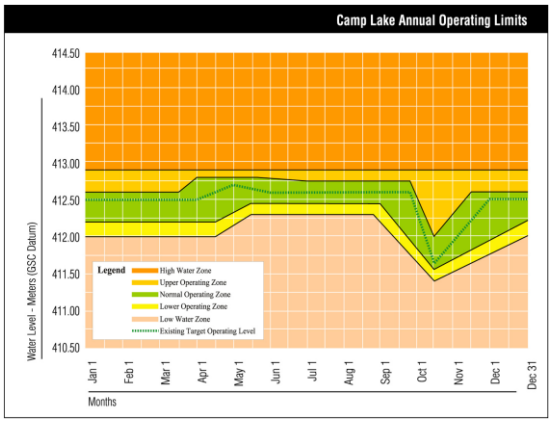
The dam maintains lake levels for canoeing, other recreational pursuits and power production. Other goals of dam operation include protection of the lake fisheries (lake trout) in the fall (no drawdown is permitted after October 15), providing some storage for spring flood control, power production and low flow augmentation downstream on the Big East River.

Camp Lake Dam



Watershed Location - This MNR dam is located at the outlet of Camp Lake, which discharges into Tasso Creek, and subsequently into Tasso Lake approximately 0.5 km downstream. The dam controls a drainage area of 17.8 km^2 and the upstream lake has a surface area of 2.2 km^2.

Structural Characteristics - This concrete dam, originally constructed in 1924 and reconstructed in 1965 and 1994, is approximately 3 m high and 40 m long, and consists of a 36.8-m spillwall, one 3.05-m sluice with 9 stop logs and a low-level square (0.76 m) outlet valve.



Operational Characteristics - The stop logs are not operated. The summer water level is maintained at a target operating level of 412.6 m GSC. A fall drawdown, between September 1 and October 15, of 1 m is achieved through the operation of the valve. The valve is then closed and the lake refills naturally.

Goal/Purpose of Dam Operation

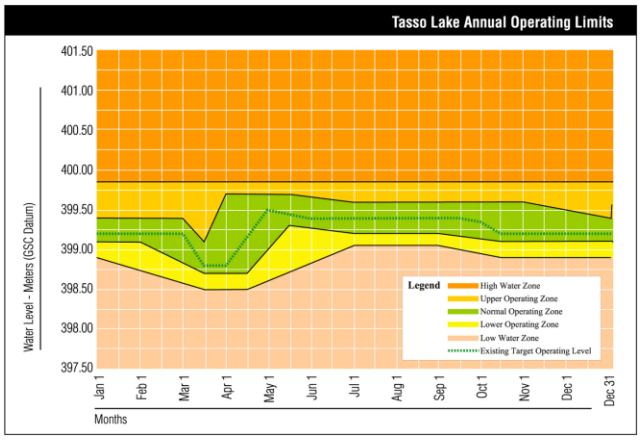
The primary purpose of this dam is recreation. Lake trout spawning protection is achieved by the fall drawdown.

Tasso Lake Dam



Watershed Location - This MNR dam is located at the outlet of Tasso Lake, which drains into Tasso Creek and joins the Big East River 4 km downstream at the site of the former Finlayson Pond.

Structural Characteristics - The dam, originally constructed in 1902 and reconstructed several times since, is approximately 4 m high and 4.3 m long. It consists of a single stop-log bay, with eight stop logs, set between two concrete piers, which form the embankment for a road over the top of the dam. The sill elevation is 397.12 m and the crest elevation of the stop logs is 399.56 m



Operational Characteristics- The dam is operated on a regular basis since all flow must pass through the single sluiceway (flow over the top of the dam could wash out the road embankment) and upstream flooding is a concern. The summer target water elevation is 399.4 m. Drawdown of 0.4 m in March for spring flood control.

Goal/Purpose of Dam Operation

The purpose of this dam is recreational, but also provides municipal road access over Tasso Creek.

Distress Dam



Distress Weir

Watershed Location - This MNR concrete overflow weir is located on the Big East River approximately 25 km downstream from the McCraney Lake Dam and controls a drainage area of 455 km^2. The upstream lake has a surface area of approximately 0.93 km^2. Outflow from the dam passes into Lake Vernon (part of the Huntsville lakes chain) approximately 23 km downstream.

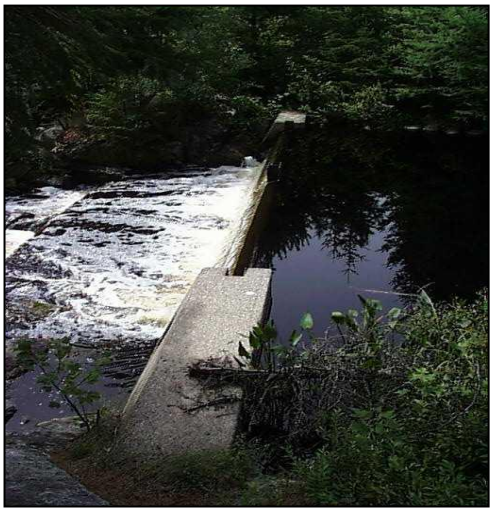
Structural Characteristics - The original dam was constructed in 1930 as a timber crib structure, and was subsequently rebuilt as a stop log equipped concrete gravity dam in 1953. In 2000, MNR reconfigured the dam as an overflow weir with notch but no gates. The dam is 3.5 m high and 30.54 m long with a 4.0 m wide notch. Notch crest is at 99.1 LCD and spillway crest is 99.4 m.

Operational Characteristics - The dam is no longer operated.

Purpose/Goal of Dam Operation

The purpose of the dam is to maintain summer water levels in the upstream reservoir for recreational purposes.

Axe Lake Dam



Watershed Location - This self-regulating MNR spill structure is located on Axe Creek near the community of Yearley, 4 km downstream from the outflow of Axe Lake and controls an upstream drainage area of 48.4 km^2. The discharge from the dam flows approximately 4 km downstream to Buck Lake.

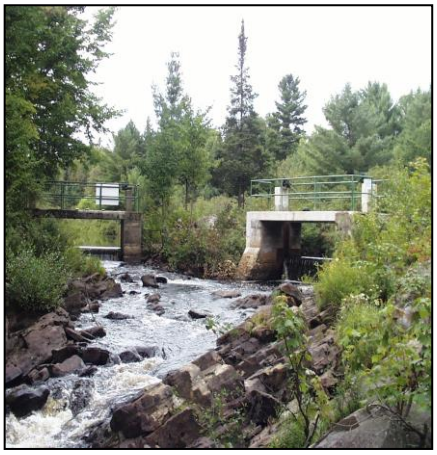
Structural Characteristics - The concrete structure is approximately 15 m long and 1.5 m high, and holds back less than 1 m of water at normal summer levels. There are two 5.8 m wide sluices each containing one stop log each and two overflow spill wall.

Operational Characteristics - Dam is not operated. Summer regulated water level is 29.33 LCD.

Purpose/Goal of Dam Operation

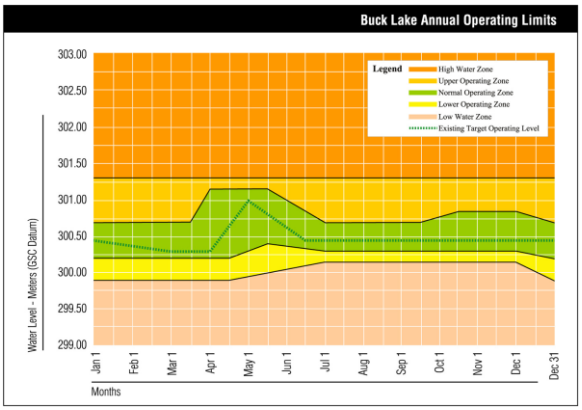
The dam provides summer water level regulation on the lake and creek for recreational purposes, as well as fire protection for the community of Yearley.

Buck Lake Dam



Watershed Location - This MNR dam is located on the Buck River, approximately 2.2 km downstream from the outlet of Buck Lake. Outflows from the dam drain into the Buck River, which enters Fox Lake 3.6 km downstream. It controls a drainage area of 205 km^2 and the upstream lake has a surface area of 2.75 km^2.

Structural Characteristics - This 3-m high concrete dam, was reconstructed in 1954. It contains two 4.27-m wide sluice structures each containing three stop logs and has three overflow spillwalls for an overall length of 38.3 m. The sill elevation is 299.3 m and the stop-log crest elevation is 300.2 m GSC.



Operational Characteristics - All stop logs are removed in the winter. The MNR dam holds back 0.92 m of water at normal summer operating levels with a target operating level of 300.45 m.

Purpose/Goal of Dam Operation

The dam is operated to control the summer water levels on Buck Lake and Fawn Lake for recreational purposes.

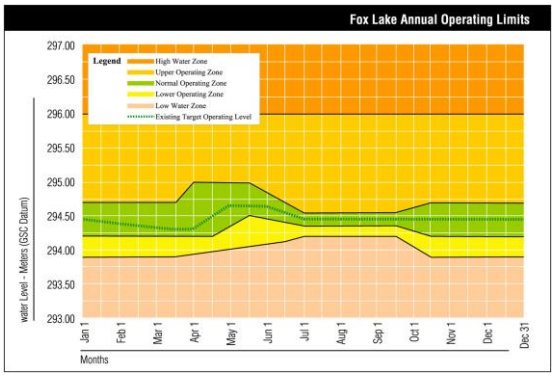
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Fox Lake Dam



Watershed Characteristics - This MNR dam is located at the outlet of Fox Lake on the Buck River. Outflow from the dam flows through a steep, 0.5-km section of the Buck River known as Hoodstown Rapids, prior to entering Lake Vernon (part of the Huntsville lakes chain). The dam controls a drainage area of 220 km^2 and the upstream lake has a surface area of 1.4 km^2.

Structural Characteristics - The dam is approximately 3 m high and 15 m long. The dam, originally constructed in 1949, was reconstructed as a concrete, 2-sluice structure in 1979. The two sluices are 4.27 m wide and contain 4 stop logs, with a height of 1.22 m from the sill to top of normal stop-log settings. There are two spillwalls, 2.15 m and 4.45 m wide with crest elevations of 295.46 m.

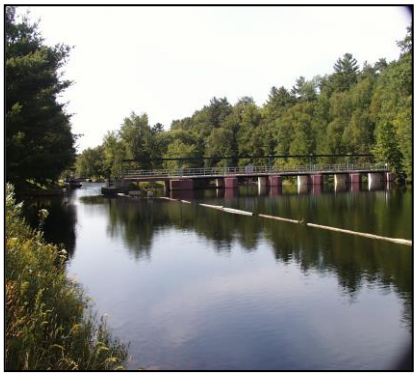


Operational Characteristics - The summer operating level is maintained at a target operating level of 294.45 m GSC and within a summer operating range of 0.2 m. The dam maintains a normal summer head of 1.2 m of water. One log in each sluice is removed in the fall and winter drawdown begins January to March 15. Lake fills naturally and all logs are gradually replaced after spring run-off has passed.

Goal/Purpose of Dam Operation

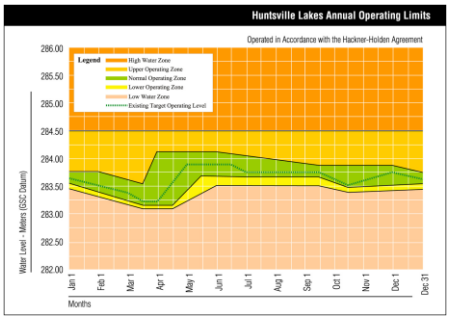
Dam is operated for recreational purposes.

Huntsville Dam



Watershed Location - This MNR dam is located on the North Branch Muskoka River, 0.7 km downstream from the outlet of Fairy Lake, and 5 km downstream from the Town of Huntsville**.** It controls the water level of Fairy, Peninsula and Vernon lakes (collectively known as the Huntsville lakes). It controls a drainage area of 1160 km^2 and the upstream lake has a surface area of approximately 30.8 km^2. Outflow from the dam passes into Mary Lake and through the Port Sydney dam before flowing through the North Branch hydroelectric generating stations.

Structural Characteristics - The 6-sluice, 4.5-m high concrete dam (51.24 m long), was originally constructed of timber in 1876 and was most recently reconstructed in 1997. There are 7 to 8 stop logs/sluice, with sill elevations from 281.56 m to 281.87 m and crest elevation of 284.0 m GSC. There is 57.91-m long spillwall with a crest elevation of 281.87 m. The dam contains a navigation lock, the concrete retaining wall is part of the lock approach channel.



Operational Characteristics - The dam is operated in accordance with the Hackner-Holden agreement. The Port Sydney (Mary Lake) dam must be operated at the same time as this dam. The dam is operated to meet a summer operating range of 30 cm with a target operating level of 283.77 m GSC. The lake is drawn down 24 cm between September 15 and October 15 prior to lake trout spawning, maximum drawdown of 0.5 m between October 15 and March 1 for egg protection. A drawdown of 0.54 m between December 1 and March 15 is for power production and spring flood protection. A minimum outflow of 3 m^3/s is to be maintained. The dam has a medium degree of difficulty to operate.

Purpose/Goal of Dam Operation

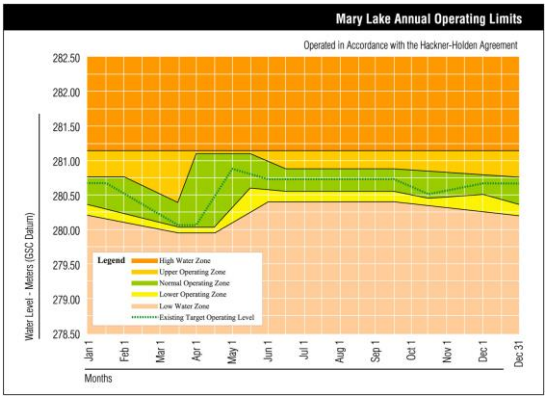
The dam is used to control water levels and flows for recreation, navigation, spring flood control, power production and fisheries. A minimum downstream flow is to be maintained for water quality and fisheries needs throughout the summer.

Mary Lake/Port Sydney Dam



Watershed Location - This MNR control dam is located in the Village of Port Sydney at the outlet of Mary Lake on the North Branch Muskoka River. Outflow from this MNR dam flows approximately 17 km downstream to the High Falls hydroelectric generating station. The dam controls a drainage area of 1394 km^2 and Mary Lake has a surface area of approximately 10.25 km^2.

Structural Characteristics - The 4-m high, 97.4-m long structure, contains seven sluiceways and one overflow spillwall. The stop-log bays are approximately 5.64 m wide and contain 5 to 7 stop logs per bay. The stop logs maximum crest elevation is between 280.85 and 280.87 m GSC, with sill elevations between 279.07 and 278.75 m GSC. The 57.91-m long spillwall has a crest elevation of 281.87 m. The dam was originally constructed as a timber crib structure in 1881, and was converted to a stone rubble masonry dam in 1914, with concrete resurfacing occurring in 1981-1982 and major repairs in 1999.



Operational Characteristics - The dam is operated in accordance with the Hackner-Holden agreement. It has a medium to high degree of difficulty to operate. All operations must be coordinated with Huntsville Dam. Normal summer operating range is 34 cm with a target operating level of 280.73 m GSC. A minimum summer baseflow of 3 m^3/s must be maintained for water quality and fisheries requirements. Fall drawdown of 22 cm occurs between September 15 and October 15 for lake trout spawning, with a maximum 0.5-m drawdown between October 15 and March 1 to help protect lake trout eggs. A 0.48-m maximum drawdown is permitted over December 15 to March 15 for spring flood control and hydro power production.

Goal/Purpose of Dam Operation

Its uses include power production, spring flood control, fisheries, navigation and recreation.

Clearwater Lake Dam



Clearwater Lake Dam

Watershed Location - This MNR dam is located at the outlet of Clearwater Lake, which flows to Devine Lake and on to the North Branch. It controls a drainage area of 3.2 km^2 and the upstream lake has a surface area of 0.8 km^2.

Structural Characteristics - The small concrete dam (1 m high) was constructed in 1939 and consists of one, 1.83 m wide sluice with one 2 x 8-in. stop log/board.

Operational Characteristics - The stop log/board is no longer operated. The lake has a normal summer head of water above the sill of 0.38 m.

Purpose/Goal of Dam Operation
The purpose of the dam is recreational.

Devine Lake Dam



Watershed Location - This small, privately owned dam is located at the outlet of Devine Lake, and discharges into a tributary to the North Muskoka River approximately 3.5 km downstream from the Port Sydney Dam.

Structural Characteristics - This concrete dam (1.5 m high) has a single 2 m wide sluice with 4 to 10 cm stop logs.

Operational Characteristics - The dam is drawn down 0.2 m after October 1 for spring flood control.

Goal/Purpose of Dam Operation

The dam is used for summer recreation, flood control and as a single-lane bridge.

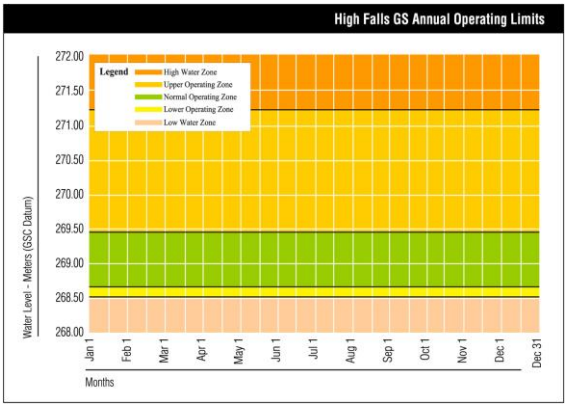
High Falls Dam and Generating Station





Watershed Location - The facility is located immediately upstream of High Falls with an upstream drainage area of 1523 km^2.

Structural Characteristics - The High Falls facility consists of a concrete dam and a generating station owned and operated by Bracebridge Generation Limited. The dam is approximately 3 m high and 28 m in length, and consists of a concrete overflow weir, an automated sluiceway and the power station intake. The facility was constructed in 1947. The powerhouse is located in a natural canyon on the west bank of the river.



Operational Characteristics - This is a run-of-river facility, with an estimated plant capacity of 10.14 m^3/s. It has an operational head of 14.6 m. If the river falls below the required plant capacity, generation is scaled back. Any excess flow is spilled, by-passing the plant. Normal summer water level is 268.83 m GSC.

Purpose/Goal of Dam Operation

The main purpose of the dam is for power production. The total installed capacity of the generating station is 0.8 MW

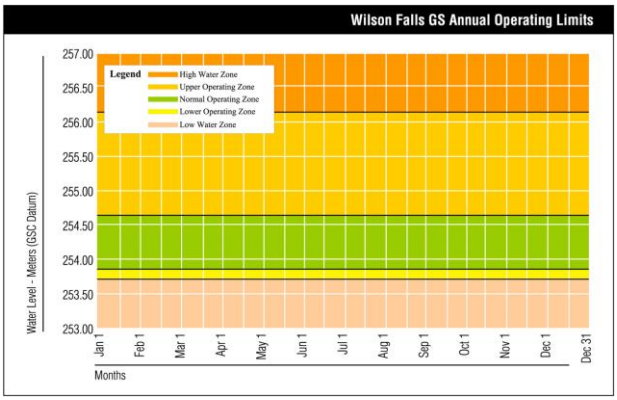
Wilson Falls Dam and Generating Station





Watershed Location - This facility is located on a bend in the North Branch, approximately 2.4 km upstream of the Town of Bracebridge. The upstream watershed has a drainage area of 1556 km^2.

Structural Characteristic - The Wilson Falls facility consists of two concrete dams and a 0.6-MW generating station owned and operated by Bracebridge Generation Limited. The main dam consists of a 109.5-m long overflow section and a 7-m wide electric gate at the apex of the river bend (upper picture). The dam elevates upstream water levels in a secondary channel near the base of the bend. The head-pond dam is located across this channel, and consists of an 8 to 10 m high concrete dam with one sluiceway and the power intake gate (lower picture). The powerhouse is located at the foot of the dam, on the downstream side of the river bend. The facility was constructed in 1909.



Operational Characteristics - This is a run-of-river facility, with an estimated plant capacity of 8.5 m^3/s. It has an operational head of 12.5 m. If the river falls below the required plant capacity, generation is scaled back. Any excess flow is spilled, by-passing the plant. Normal summer water level is 254.08 m GSC.

Purpose/Goal of Dam Operation

The main purpose of the dam is for power production. The total installed capacity of the generating station is 0.6 MW.

Bird's Mill Dam



Watershed Location – The dam is located in Bracebridge beneath Muskoka Road 37 approximately 200 m upstream of the Bracebridge Falls Dam and generating station. The dam is owned by the District Municipality of Muskoka.

Structural Characteristic - The dam is primarily a masonry structure and makes efficient use of the natural rock outcrops within the river. It resembles an "L" shape and is comprised of three sluiceways. Each sluiceway is fitted with 12-in square stop logs.

On the west bank of the river, a short channel has been constructed to direct a portion of the river flow through the Bird's Mill Pump House. This flow drives the wheels operating the water pumps which are a tourist attraction. There are also two minor natural spillways, one on either side of the concrete pier for the Bird's Mill Bridge between two of the sluiceways.

Operational Characteristics

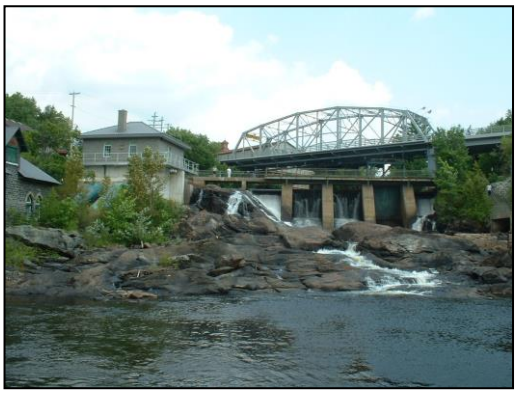
The Bird's Mill Dam has no power generating facilities and its principal role is to facilitate nearby recreational uses (navigation, fishing, etc). The streamflow through the dam is entirely dependent on the water that is available in the natural flow of the river. The main objective of dam operation is to regulate water levels within the reach of river from Bird's Mill Dam to Wilson's Falls, with the greatest effect of the dam 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".

Purpose/Goal of Dam Operation

The majority of the dam structure was once used in the production of hydroelectricity. A small section of the dam was once used to divert river flow to water driven pumps that were, in turn, used to pump potable water to the citizens of Bracebridge. Also, at the turn of the 20th Century, the dam was used to assist in log transportation

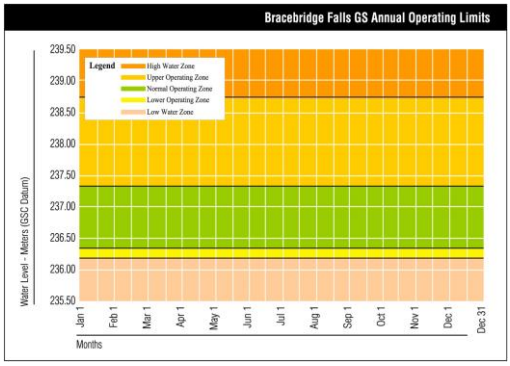
The dam is no longer used for these or any other purposes relating to the production of goods and services.

Bracebridge Falls Dam and Generating Station



Watershed Location
The facility is located at Bracebridge Falls within the Town of Bracebridge and has an upstream drainage area of 1568 km^2.

Structural Characteristics - The Bracebridge Falls facility, owned by Bracebridge Generation Limited, consists of a 32.3 m long dam (including 4 sluices and 3 spillways) and powerhouse. It was originally constructed in 1900 (second generator added in 1904), and produces 0.6 MW of power from two 300-kW generators that are still in service. The powerhouse is original, while the dam was rebuilt in 1957.



Operational Characteristics - This is a run-of-river facility, with an estimated plant capacity of 10.5 m^3/s. It has an operational head of 10.4 m. If the river falls below the required plant capacity, generation is scaled back. Any excess flow is spilled, by-passing the plant. Normal summer water level is 235.64 m GSC.

Purpose/Goal of Dam Operation
The main purpose of the dam is for power production. The total installed capacity of the generating station is 0.6 MW.

5.3 South Branch Structures and Current Operating Strategies

There are 13 water control structures on the South Branch of the Muskoka River and its tributaries. Of these, 9 are owned and operated by MNR, while 3 are owned and operated by OPG and 1 by Orillia Power Generation Corporation. The location, key characteristics and a photo of each South Branch structure is provided in Figure 5.1b. Livingstone and Fletcher Lake dams are not operated as control dams and were not considered further in the WMP.

Table 5.1 (a)
Physical Features of Control Dams

Dam Site No.	(1) Structure Name (Location)	(2) Watercourse	(3) Type of Structure	(4) Description of Dam	(5) Approx. Height (m)	(6) Control Section Details	(7) Drainage Area (km^2)	(8) Lake Surface Area (km^2)	(9) Summer RWL (m)	(10) Owner/ Operator	(11) Purpose/Use of Structure	(12) Est. Mean Monthly Flow (m^3/s)	(13) WL Gauge (Y/N)
Control Dams													
1	Kawagama Lake Dam	South Muskoka River	Concrete	Sluices (2), Spillwalls (2)	5	2-4.27 m sluices, 14.26 m, and 1-31.0 m spillwalls	380	31.9	355.6 GSD	MNR	Rec., Nav., WC, P, Fish.	n/a	Y
2	Burnt Island Lake Dam	Joe Lake	Concrete	Sluice (1), Spillwalls (2), Valve (1X)	4.2	1-3.66 m sluice, 0.75 m and 6.78 m spillwalls, 0.76x0.76 m valve	59.1	8.8	428.5 GSD	MNR	Rec., Fish.	n/a	Y
3	Joe Lake Dam	Oxtongue River	Concrete	Sluice (1), Spillwall (1), Valve (1X)	4.5	4.27 m sluice, 20.73 m spillwall, 0.91x0.91 m valve	117.9	5.83	421.85 GSD	MNR	Rec., Fish., WC	n/a	Y
4	Tea Lake Dam (Canoe, Smoke & Tea Lakes)	Oxtongue River	Concrete	Sluices (2), Spillwall (1), Valve (1X)	4	2-4.27 m sluice, 27.47 m spillwall, 0.91x0.91 m valve	344	12.53	417.82 GSD	MNR	Rec., Nav., WC, P, Fish.	6.2	Y
5	Baysville Dam (Lake of Bays)	South Muskoka River	Concrete	Sluices (9), Spillwall (1)	3.5	4.27 m sluice, 32.1 m spillwall	1481	68.4	315.22 GSD	MNR	Rec., Nav., WC, P, Fish.	23	Y
6	Wood Lake Dam	South Muskoka River	Concrete	Sluice (1), Spillwall (1)	2.5	4.27 m sluice, 1.22 m spillwall	34.7	3.76	301.06 GSD	MNR	Rec.	n/a	Y
7	Camp Lake Dam	Tasso Creek	Concrete	Sluice (1), Spillwall (1), Valve (1)	3	3.05 m sluice, 36.8 m spillwall, 0.76x0.76 m valve	17.8	2.2	412.6 GSD	MNR	Rec.	n/a	Y
8	Tasso Lake Dam	Tasso Creek	Concrete	Sluice (1)	4	4.27 m sluice	42	1.89	399.4 GSD	MNR	Rec.	n/a	Y
9	McCraney Lake Dam	Big East River	Concrete	Sluice (1), Spillwall (1), Valve (1)	6	4.27 m sluice, 7.58 m spillwall, 0.76x0.76 m valve	44.3	4.4	444.85 GSD	MNR	Rec., P	n/a	Y
10	Buck Lake Dam	Buck River	Concrete	Sluices (2), Spillwalls (5)	3	2-4.27 m sluices, 7.32 m, 3.15 m, 7.32 m, 7.85 m, and 4.11 m spillwalls	205.1	2.75	300.45 LCD	MNR	Rec.	n/a	Y
11	Fox Lake Dam	Buck River	Concrete	Suices (2), Spillwalls (2)	3	2-4.27 m sluices, 2.15 m, 4.45 m spillwalls	218.8	1.4	294.45 GSD	MNR	Rec.	n/a	Y
12	Huntsville Dam (Vernon, Peninsula, Fairy Lakes)	North Muskoka River	Concrete	Sluices (6), Spillwals (1), Nav. Lock	4.5	4-5.6 m sluices, 5.3 m and 6.1 m sluices, 15 m spillwall	1160	30.8	283.77 GSD	MNR	Rec., Nav., WC, P, Fish.	n/a	Y
13	Port Sydney Dam (Mary Lake)	North Muskoka River	Masonry & Concrete	Sluices (7), Spillwall (1)	4	3-5.67 m sluice, 4-5.64 m sluices, 57.91 m spillwall	1391	10.25	280.73 GSD	MNR	Rec., Nav., WC, P	24.3	Y
14	Clearwater Lake Dam	Trib. To N. Muskoka	Concrete	Sluice (1)	1	1-1.83 m sluice	3.15	0.79	30.3 LCD	MNR	Rec.	n/a	N
15	Skeleton Lake Dam	Bent River	Concrete	Spillwall (2), Valve (1X)	2	6.0 and 4.0 m spillwalls, 1-0.91 m diameter valve	70.6	20.4	280.69 GSD	MNR	Rec.	n/a	Y
16	Port Carling Dam (Lakes Rosseau & Joseph)	Indian River	Concrete	Sluices (6), Spillwalls (2)	3.5	6-4.27 m sluices, 5.4 m, and 7 m spillwalls	798	116.3	226.02 GSD	MNR	Rec., Nav., WC, P	n/a	Y
17	North Bala Dam (Lake Muskoka)	Muskoka River	Concrete	Sluices (6)	4	1-4.88 m sluice, 5-6.1 m sluices	4683	120	225.4 GSD	MNR	Rec. Nav., Fish., P	76.3	Y
18	South Bala Dam (Lake Muskoka)	Muskoka River	Concrete	Sluices (8), Spillwalls (2)	4	8-4.27 m sluices, 18.77 m, and 5.13 m spillwalls	4683	120	225.4 GSD	MNR	Rec. Nav., Fish., P	76.3	Y
19	Go-Home Lake Dam #1	Musquash River	Concrete	Sluices (4)	5.5	4-4.27 m sluices	4802	6.76	185.15 GSD	MNR	Rec.	62.7	Y
20	Moon Dam	Moon River	Concrete	Sluices (8)	8	8-4.27 m sluices	4707	n/a		OPG	WC, Fish.	n/a	Y
21	Mathias Falls Dam	South Muskoka River	Concrete	Sluices (2), 1 waste gate	13.7	3-4.87 m sluices	1642	n/a	292.61 LCD	OPC	P	n/a	Y
22	Trethewey Falls Dam	South Muskoka River	Concrete	Sluices (3), Spillwalls (1)	12	3-4.57 m sluices, 1-55.5 m spillwall	1656	n/a	279.0 GSD	OPG	P	n/a	Y
23	Hanna Chute Dam	South Muskoka River	Concrete	Sluices (3)	13.5	3-4.57 m sluices	1683	n/a	268.3 GSD	OPG	P	n/a	Y
24	South Falls Dam	South Muskoka River	Concrete	Sluices (3)	7	3-4.42 m sluices	1683	n/a	259.0 GSD	OPG	P	n/a	Y
25	High Falls Dam	North Muskoka River	Concrete	Sluices (5)		2-4.87 m sluices, 2.44 m, 11.28 m, and 4.27 m sluices	1523	n/a	268.83	BGL	P	n/a	Y
26	Wilson Falls Main Dam	North Muskoka River	Concrete	Sluices (3), Spillwalls (3)		Main Dam: 1-7 m gate, 3- spillwalls 109.5m long Spill Dam: 1-2.87 m sluice, 1-3.05 m gate	1556	n/a	254.1	BGL	P	n/a	Y
27	Bracebridge Falls Dam	North Muskoka River	Concrete	Sluices (4), Spillwalls (3)		2-4.87 m sluices, 1-4.57 m sluice, 1-2.44 m sluice 5.79 m, 5.33 m, and 4.45 m spillwalls	1568	n/a	235.64	BGL	P	n/a	Y
28	Ragged Rapids Dam	Musquash River	Concrete	Sluice (1)	10	1-6.1 m sluice	4707	n/a	219.2 GSD	OPG	P	n/a	Y
29	Big Eddy Dam	Musquash River	Concrete	Sluices (4), Spillwall (1)	10	4-4.27 m sluices, 1-88.39 m spillwall	4724	n/a	206.8 GSD	OPG	P	n/a	Y
30	Ragged Lake Dam	Tea Creek	Concrete	Sluice (1), Spillwalls (2), Valve (1)	3.5	1-2.44 m sluice, 44.3 m and 65.8 m spillwalls, 0.76x0.76 m valve	69.9	4.12	432.3 GSD	MNR	Rec., WC	n/a	Y
31	Bird's Mill Dam	North Muskoka River								DMOM			
32	Burgess Dam	Muskoka River	Concrete	Power Intake	4	n/a	4683	120	225.4 GSD	AP	P	n/a	Y

Abbreviations:
P - Hydropower; WC - Water control
IWS - Industrial Water Supply; Rec. - Recreation
Nav. - Navigation; Fish. - Fisheries
LF - Low Flow Augmentation
DWS - Domestic Water Supply; FP - Fire Protection of village/town
RC - Reinforced concrete
RWL - Regulated Water Level
LCD - Local Construction Datum
GSD - Geodetic Survey Datum
MNR - Ministry of Natural Resources
OPG - Ontario Power Generation
AP - Algonquin Power
OPC - Orillia Power Generation
BGL - Bracebridge Generation Ltd.
DMOM - District Municipality of Muskoka

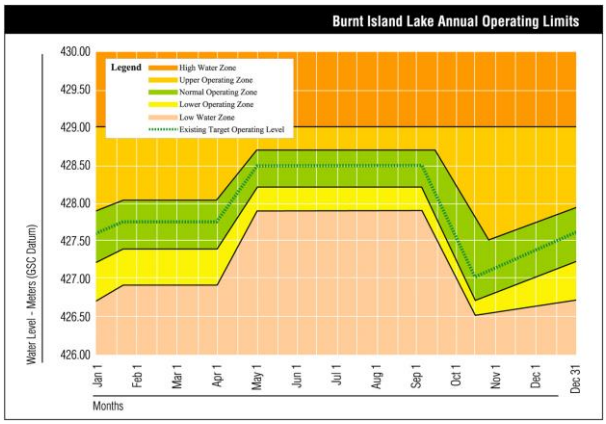
Notes:
Mean monthly flow values were derived from WSC gauges directly below the dams in question, with exception of Go-Home Dam.
WSC gauges used to estimate mean monthly flow included: 02EB004, 02EB006, 02EB008, 02EB012, 02EB013, 02EB014
Mean monthly flow for Go-Home Dam represents dam inflow, all other flows represent dam outflow.
WSC flow data below Distress, Bala, and Tea Dams was prorated to these respective dam sites.
X - valve not operational

Burnt Island Lake Dam



Watershed Location - This MNR dam is located at the outlet of Burnt Island Lake in Algonquin Park, approximately 13 km north of Highway 60. It controls a drainage area of 59.1 km^2 and the upstream lake has a surface area of 8.8 km^2. The lake forms part of the headwaters of the Oxtonque River that eventually drains into Lake of Bays.

Structural Characteristics - The 4-m high concrete dam was rebuilt in 1957, has a single 3.66-m wide sluiceway with 9 stop logs, a low flow valve that has been permanently closed and has two overflow spill walls with a total length of 16.5 m.



Operational Characteristics - The summer target operating level is 428.5 m GSC with a summer operating range of 0.5 m. The lake is drawn down between September 1 and October 15 by 1.5 m for lake trout spawning. Three stop logs are not replaced in the dam until just prior to the spring freshet, when they are returned and capture the entire spring freshet. No spring flows are released out of the dam into Joe Lake, thus, providing some flood control to the lower part of the system.

Goals/Purpose of Dam Operation

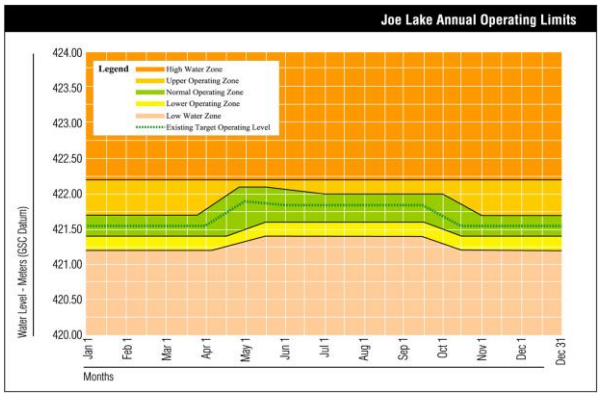
Dam is used for maintaining summer recreational water levels, lake trout spawning protection and flood control.

Joe Lake Dam



Watershed Location - This MNR dam is located within Algonquin Park at the outlet of Joe Lake and controls water levels on Joe Lake as well as Little Joe, Tepee, Littledoe, Bluejay and Tom Thomson lakes. Outflow from this dam is the main inflow into Tea Lake. The dam controls a drainage area of 117.9 km^2 and the total lake surface area is 5.83 km^2.

Structural Characteristics - This 4.5-m high concrete dam has a single 4.27-m wide sluice with up to 9 stop logs, a low flow valve that has been permanently closed, and approximately 21 m of overflow spillwall. The sill elevation is at 418.94 m and the spillwall is at 421.99 m. It was rebuilt in 1963.



Operational Characteristics - Operation is moderately difficult as no road access is available. The summer target operating level is 421.85 m GSC with a summer operating range of 0.4 m. The lake is drawn down between September 1 and October 15 by 0.3 m for lake trout spawning. There is no further winter drawdown and levels remain above 421.40 m. Two stop logs are replaced just prior to the spring freshet to capture some of the runoff.

Goal/Purpose of Dam Operation

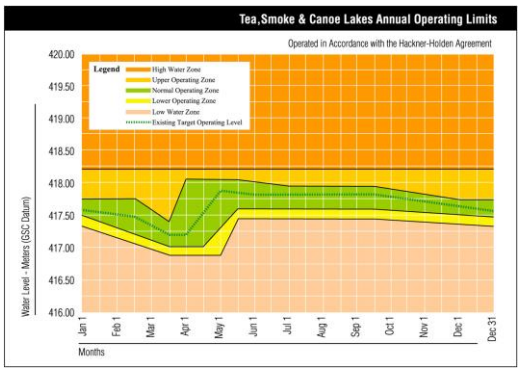
It is operated for summer recreational needs, flood control purposes and fisheries protection (i.e., spawning lake trout).

Tea Lake Dam



Watershed Location - The Tea Lake dam is located 0.3 km north of Highway 60, within the boundaries of Algonquin Park, and is also owned and operated by MNR. The dam controls water levels in Tea, Bonita, Canoe and Smoke Lakes. Tea Lake, Bonita Lake and Canoe Lake are on the Oxtongue River, while Smoke Lake is on Tea Creek, a tributary to the Oxtongue River. The dam controls a drainage area of 344 km^2 and the surface area of the upstream lakes is12.53 km^2. Outflow from this dam drains into the Oxtongue River, Oxtongue Lake and subsequently into Dwight Bay on Lake of Bays, approximately 30 km downstream.

Structural Characteristics - This 4-m high, 36-m long concrete dam consists of a 27.4-m long overflow spillwall, two sluiceways with 9 stop logs, and a low-level valve. The sill elevation is 415.21 m and the spill wall crest is 417.95 m GSC, the dam retains a normal summer head of 2.61 m.



Operational Characteristics - The dam is operated in accordance with the Hackner-Holden agreement. The summer water level is maintained at a target operating level of 417.82 within a normal operating range of 0.35 m. There is a drawdown of 0.34 m between September 15 and February 15, to minimize ice-cracking at the shoreline and a further drawdown of 0.28 m February 15 to March 15. Minimum outflow of 1.4 m^3/s is required for downstream fisheries and water quality needs.

Goals/Purpose of Dam Operation

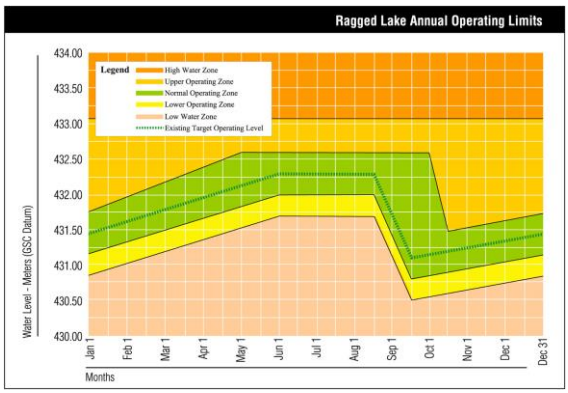
Tea Lake is used as storage to prevent flooding on Lake of Bays. Its primary purposes are controlling summer recreation levels, navigation, spring flood control, fisheries and winter power generation.

Ragged Lake Dam



Watershed Location - This MNR dam is located approximately 7.6 km south of Highway 60 in Algonquin Park at the outlet of Ragged Lake (which is adjacent to the southwest park boundary), with outflows entering the south end of Smoke Lake. The dam controls a drainage area of 69.9 km^2 and Ragged Lake has a surface area of 4.12 km^2.

Structural Characteristics - The 112-m long, 3.5-m high concrete dam consists of one inoperable 2.4-m wide sluice (consisting of 9 stop logs), two extended spillwalls and a low-level outlet valve (0.76 m x 0.76 m).



Operational Characteristics - The valve is opened mid August and closed in the beginning of October to provide a fall drawdown of 1.1 m. The long spillwalls have enough discharge capacity to eliminate wide fluctuations of water level, and a 5-m long 0.75-m deep breach in one spillwall serves to establish the summer water level

Goals/Purpose of Dam Operation

Dam provides summer water levels for recreational uses (i.e., canoeing).

Livingstone Lake Dam

This small concrete dam (2 m high, 20 m long) is located at the outlet of Livingstone Lake on Livingstone Creek, which discharges into Kawagama Lake. This MNR structure is not operated and functions as an overflow weir. The dam maintains a normal summer head of 0.6 m for recreational purposes.

Fletcher Lake Dam

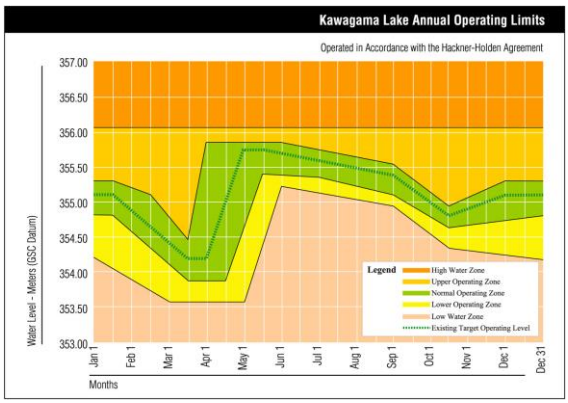
This 30.4-m long dam is located at the outlet of Fletcher Lake and discharges through Fletcher Creek into Fletcher Bay on Kawagama Lake. The 3.5 m high MNR dam was constructed in 1963 with a low-level valve, which has been permanently sealed in the closed position. The dam serves to maintain recreational uses, and holds back a normal summer water depth of 2.3 m.

Kawagama Lake Dam



Watershed Location - This dam is located at the outlet of Kawagama Lake in River Bay, approximately 13 km east of Dorset. Outflow from the lake passes through the Hollow River and into Trading Bay on Lake of Bays approximately 11 km downstream. The dam controls a drainage area of 380 km^2 and the upstream lake has a surface area of 31.9 km^2.

Structural Characteristics - This 5 m high dam is approximately 54 m long and was originally constructed of timber in 1890. It was subsequently reconstructed of stone rubble masonry in 1926 and resurfaced with concrete in 1985. The dam has two 4.27-m wide sluices with a maximum of 11 stop logs each (usually the bottom 4 logs are not removed). The sill elevation is at 352.25 m GSC. There are two spill walls with a total length of 44.26 m. The spillwall crests are at 356.21 m and 356.45 m GSC. The normal summer (July 1) head of water held by the dam is 3.35 m.



Operational Characteristics - This MNR dam was owned by Ontario Hydro until 1968, and is operated in accordance with the Hackner-Holden agreement. This is the only lake on the system with a summer drawdown. The target level for May 15 is 355.76 m and for September 1 is 355.38 m (0.38-m drawdown). There is a fall drawdown of 0.28 (September 1 to October 15) and winter drawdown of 0.61 m (October 15 to March1).

Goal/Purposes of Dam Operation

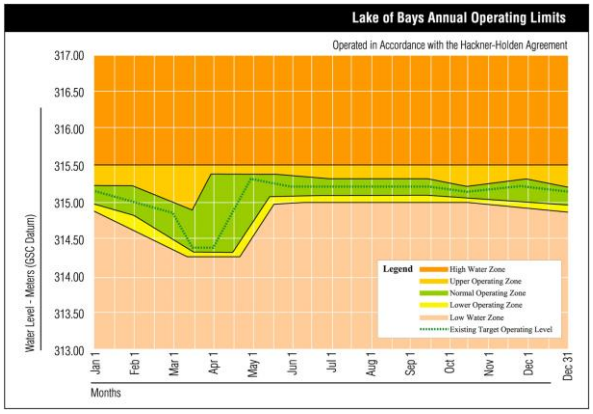
Purposes of the dam include recreation, navigation, spring flood control, fisheries and winter drawdown for downstream power generation. The fall drawdown of 0.28 m was established to force lake trout to spawn at a lower level to help protect eggs from winter drawdown for hydro production. Maximum winter drawdown was set to protect lake trout eggs. The winter drawdown for hydro production is aimed to maintain a flow of 16.8 m^3/s at the Trethewey generating station

Lake of Bays/Baysville Dam



Watershed Location - This MNR dam is located in the village of Baysville at the outlet of Lake of Bays into the South Muskoka River. Inflows to the lake are primarily from the Oxtongue River and Hollow River, there are a few other minor tributaries. Outflow past the dam travels approximately 25 km before reaching the Matthias Falls hydroelectric generating station, the first in a line of four power stations on the South Muskoka River. The dam controls a drainage area of 1481 km^2 and the surface area of the upstream lake is 68.4 km^2.

Structural Characteristics - The 3.5-m high dam consists of nine, 4.3-m wide sluices (with 6 stop logs) and a 32.1-m spillwall (70.5 m total length). The sill elevation is 313.53 m GSC and the crest of the spillwall is 315.29 m GSC.



Operational Characteristics - The dam is operated in accordance with the Hackner-Holden Agreement. The target summer operating level is 315.22 m GSC within a normal operating range of 0.22 m (for channel navigation and summer recreation). The dam holds back 1.7 m of water at the normal Lake of Bays summer water level. Minimum outflow from the lake is 2.8 m^3/s. There is a fall drawdown of 0.06 m between September 15 and October 15 (for lake trout spawning) and a 0.27 m maximum winter drawdown (October 15 to March 1) to protect lake trout eggs with a further 0.46 m allowed March 1 to April 1 for hydro generation. The aim is to provide a winter flow of 16.8 m^3/s for the Trethewey generating station. All dam operations must be coordinated with downstream power operators.

Goals/Purpose of Dam Operation

The dam provides power production, fisheries, recreation, navigation and spring flood control.

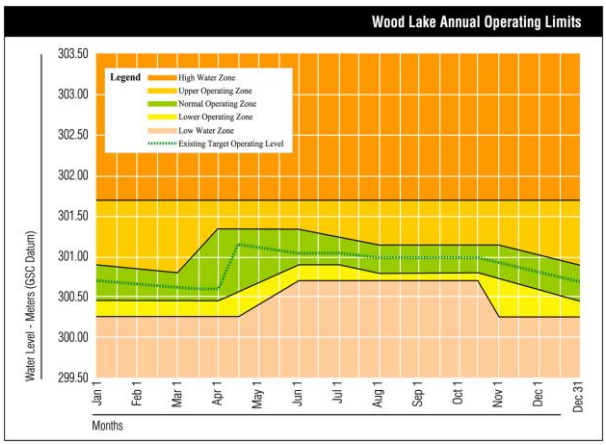
Wood Lake Dam



Watershed Location

The dam is located approximately 32 km southeast of Bracebridge at the outlet of Wood Lake and controls Wood Lake only. It has a drainage area of 34.7 km^2 and the upstream lake surface area is 3.76 km^2. Flow from Wood Lake discharges into the South Muskoka River at a point approximately 5.5 km upstream from the Matthias Falls Generating Station.

Structural Characteristics - This 2.5 m high MNR dam was originally constructed of timber in 1949 and subsequently reconstructed of concrete in 1983. The dam consists of one 4.3-m sluiceway with 4.5 stop logs and a 1.22-m long spillwall. The sill elevation is 299.84 m GSC and the crest of the spillway is 301.06 m GSC.



Operational Characteristics -

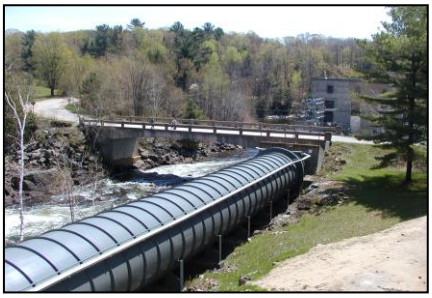
The lake has a relatively narrow summer operating range of 0.3 m as there is extensive shoreline development. The normal summer head of water is 1.22 m. There is a fall drawdown from October 15 to November 1 of 0.56 m. The dam is not operated in the winter. The logs are usually replaced after spring runoff around May 1.

Purpose/Goal of Dam Operation

The dam is operated for recreational purposes.

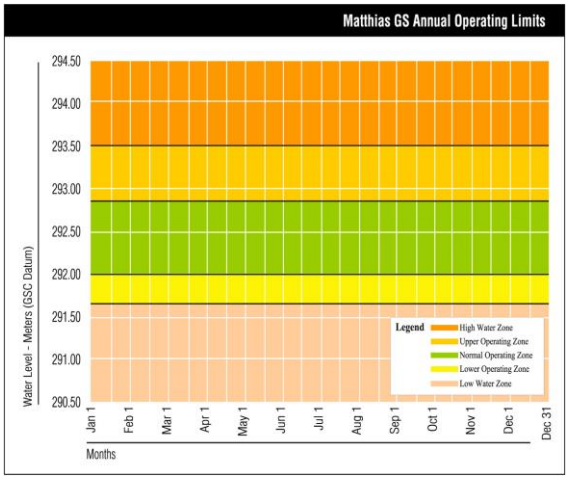
Matthias Falls Dam and Generating Station





Watershed Location - Matthias Falls is located on the South Branch of the Muskoka River about 10 km directly southeast of Bracebridge. It is the most upstream of four generating stations on the South Branch and has an upstream drainage area of 1642 km^2.

Structural Characteristics - The Matthias Falls dam and generating facility was constructed in 1950 and is owned and operated by Orillia Power Generation Corporation. The current dam is 13.7 m high, approximately 270 m long, and contains 3 sluiceways (2 manual, 1 remotely operated) and the intake for the downstream powerhouse. Water is passed to the powerhouse through a 4.6 m diameter penstock.



Operational Characteristics - The plant is mainly operated as a run-of-river facility with 2.7 days storage at maximum discharge capacity. On an hourly and daily basis, the head pond typically fluctuates over a 0.92 to maximum of 1.8 m range. Nominal head pond level is 292.91 with a maximum of 293.5m. A minimum flow of 3.0 m^3/s is to be released for walleye spawning requirements at the base of South Falls

Goal/Purpose of Dam/Generating Station

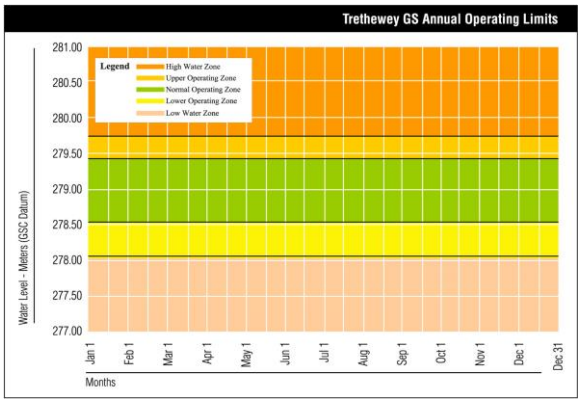
The facility is capable of generating 2.81 MW of electricity at normal operation. .

Trethewey Falls Dam and Generating Station



Watershed Location - The Trethewey Falls dam and generating station are owned by OPG, and located approximately 5 km downstream from Matthias Falls. Outflow from the facility discharges into the forebay of the Hanna Chute station, located 3.2 km downstream. The dam controls a drainage area of 1656 km^2.

Structural Characteristics - The 12-m high concrete dam contains three 4.57-m sluiceways, and the power station intake, and extends a total length of 67 m. The powerhouse is located approximately 22.9 m to the west of the sluiceways, and discharges to a tailrace separated from the main sluiceway channel by a small island. The dam and powerhouse were completed in 1929.



Operational Characteristics - Plant is a run-of river operation with no seasonal water level changes. Nominal head-pond level is 278.98 m with a normal and absolute operating range of 0.91 (to 279.43 m) and 1.68 m (to 268.84 m) respectively. Maximum plant capacity is 19.9 m^3/s.

Goals/Purpose of Facility

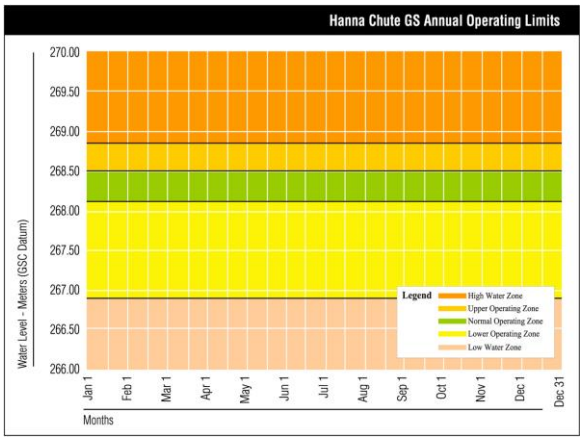
The facility has 1.74 MW of generating capacity. The dam provides an operating head of 10.7 m.

Hanna Chute Dam and Generating Station



Watershed Location - The dam and generating station are located approximately 750 m upstream from the South Falls dam and has a drainage area of 1683 km^2.

Structural Characteristics - The OPG owned Hanna Chute dam and powerhouse are an integrated structure. The dam consists of 2 (35 m and 12 m long) wingwalls, the powerhouse, and three 4.9-m wide sluiceways. The dam is approximately 13.5 m high.



Operational Characteristics - The facility is a run of river operation with no seasonal water level changes. Normal operating range is 0.39 m (268.11 m to 268.5 m) with a maximum possible range of 1.95 m). The dam exerts an upstream influence to the foot of Trethewey Falls, and maintains a normal head of approximately 9 m above the South Falls head pond.

Goal/Purpose of Dam Operation

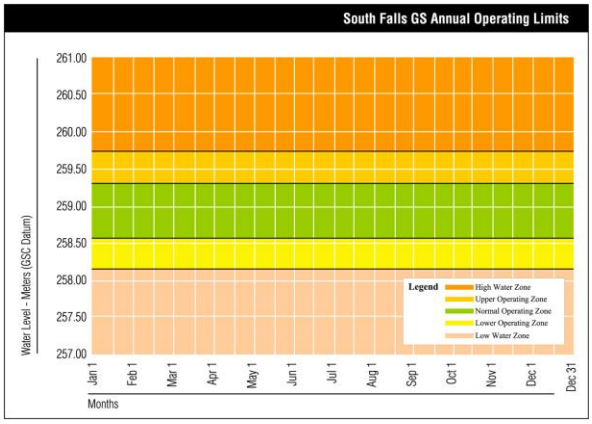
The facility has 1.46 MW of generating capacity under normal conditions.

South Falls Dam and Generating Station



Watershed Location - The South Falls dam and generating station are owned by OPG, and are located on the South Muskoka River approximately 4 km upstream from its confluence with the North Muskoka River. It has a drainage area of 1683 km^2. It is immediately downstream of Hanna Chute.

Structural Characteristics - The 6-m high, 11-m long concrete dam was built in 1904, and contains three power station intakes (connections to penstocks), two operable sluiceways, and is located on the east side of Highway 11. The powerhouse is situated 308 m downstream on the west side of Highway 11, and is connected to the dam by three wood stave penstocks.



Operational Characteristics - The facility is a run-of-river operation with no seasonal water level changes. Normal operating range is 0.73 m (259.32 m to 258.59 m) with a maximum possible range of 1.56 m. A downstream flow release of 3 m^3/s is required during the walleye spawning period (for walleye spawning in the South Falls bypass channel).

Goal/Purpose of Dam Operation

The facility has three units with a total generating capacity of 5 MW.

5.4 Lower Subwatershed Structures and Current Operating Strategies

There are 13 water control structures on the Lower Subwatershed of the Muskoka River and its tributaries. Of these, 9 are owned and operated by MNR, 3 by OPG, and 1 by Algonquin Power. The location, key characteristics and a photo of each Lower Subwatershed structure is provided in Figure 5.1c. Four of these structures are spill dams (Kapikog Lake, Healey Lake, Gull Lake and Go-Home Lake Dam No. 2) and the operation of a further two dams (Skeleton Lake and Go-Home Lake) will not change. These dams are described in this section, but are not further discussed in this WMP as no changes to their operations are proposed.

Skeleton Lake Dam

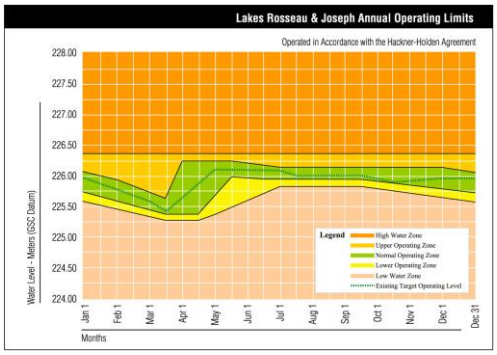
This MNR dam is located at the outlet of Skeleton Lake, which discharges into the Bent River and subsequently Lake Rosseau located approximately 5 km downstream. The dam was reconstructed in 2001 as a 10-m long overflow spillwall with a low-level valve, which maintains a normal summer head of 0.53 m of water. The dam is maintained for recreational purposes.

Port Carling Dam



Watershed Location - This MNR dam is located on the Indian River at the outlet of Lake Rosseau in the Village of Port Carling. It controls the levels in both Lake Rosseau and Lake Joseph. The dam controls a drainage area of 798 km^2 and the upstream lakes have a total surface area of 116.3 km^2. Outflow from the dam drains into the north end of Lake Muskoka (*Indian River).*

Structural Characteristics - The 3.5-m high concrete dam consists of six 4.27-m wide sluices (with 8 stop logs) and 12.4 m of overflow spillwall, and holds back 0.62 m of water in the upstream lakes (Rosseau and Joseph) during normal summer conditions. The sill elevation is 223.73 m GSC and the spillwall crest elevation is 226.47 m GSC. A set of navigation locks, used for small recreational vessels, is incorporated into the structure. The dam and small navigation locks form one structure located in a natural outlet channel from the lake while a large navigation lock is located in a diversion channel on the west side of the island.



Operational Characteristics - The dam is operated in accordance with the Hackner-Holden agreement. The lakes are maintained with a narrow summer operating range (0.2 m), with a target operating level of 226.02 m GSC, to facilitate navigation of large boats (steam ships) through the locks and access to many of the docks around the lake. The large lock must be maintained with a minimum depth of 2.65 over the sill. The normal summer head is 0.62 m. Fall drawdown is 0.1 m from September 15 to October 15 to set level for lake trout spawning and there is a maximum winter drawdown between October 15 to March 1 of 0.45 m to protect incubating lake trout eggs. A minimum discharge of 0.7 m^3/s is required during dry conditions for water quality purposes. The flow from the lake to the dam is through a narrow 200 m rock channel in the Indian River which can result in water levels of up to 0.2 m between the lake level and dam in high flows. Dam discharges greater than 20 m^3/s can affect navigation through the locks and flows in excess of 42.5 m^3/s downstream causes flood damage.

Goal/Purpose of Dam Operation

The dam is used for navigation, recreation, spring flood control, fisheries, and power production.

Gull Lake Dam

This MNR dam is located on the Hoc Roc River, immediately downstream from the outlet of Gull Lake. The dam is a non-operational weir that regulates water levels on Gull Lake for recreational and cottage purposes. The dam was reconstructed in 1953 by the Ontario Department of Public Works. The Town of Gravenhurst removes debris from the dam when necessary. Flow from the river drains into South Bay on Lake Muskoka.

Bala North and South Dams and Swift River Energy Ltd. North Bala Generating Station



Bala North Dam

Watershed Location - MNRF's Bala North and Bala South dams and the Swift River Energy Ltd. North Bala Generating Station are located at the main outlets of Lake Muskoka – the largest lake in the watershed. These facilities control water levels on Lake Muskoka up to the Port Carling dam to the north and Bracebridge Falls (on the North Muskoka River) to the east. Water from the entire Muskoka watershed up to this point drains through these dams and the generating station. Outflow from the site enters the Bala Reach of the Moon River. The site controls a drainage area of 4683 km^2 and the surface area of the lake of 120 km^2.

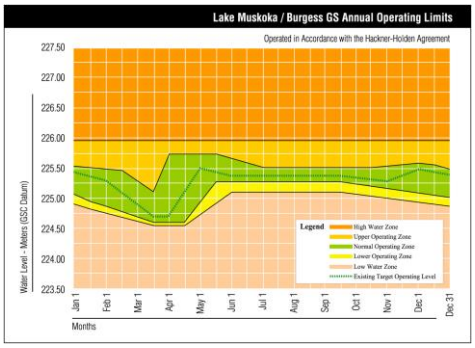


Bala South Dam

Structural Characteristics - Both dams are owned by MNRF and were originally constructed in 1915 and have since been repaired/upgraded several times. The North dam is 4 m high and contains four sluices with 7 or 8 stop logs and two sluices with electrically operated sluice gates, being approximately 35 m in length.

Water discharges differently between the sluiceways with stop logs versus sluiceways with sluice gates. Water discharges over the top of the stop logs in the sluiceways containing stop logs. Whereas water discharges underneath the sluice gates in the sluiceways with electrically operated sluice gates. The southernmost pier of the North dam is integrated into the intake structure of the powerhouse providing direct access between the North dam deck and

approximately 4.5 MW at a gross head of 6.2m.



Operational Characteristics - Swift River Energy Ltd. operates both the MNRF owned dams and the generating station. The dams are operated under the Hackner-Holden agreement. The dams are located at the lower end of the watershed and complex operation of the dams is required, in conjunction with passage of flow through the generating station for energy production. Flooding can occur both upstream and downstream of the dams during heavy rainfall events and a balance is required between flooding the lake and the downstream Bala Reach. Outflows greater than 283 m^3/s causes downstream flooding. The downstream operating flows below the Bala site is shown in the adjacent chart. An 85 m^3/s outflow is maintained where possible during the winter for downstream power production. SREL will provide minimum uninterrupted flows out of Lake Muskoka for OPG to meet its obligations of the Moon River Mitigation/Avoidance Plan. A minimum flow of 3.0 m^3/s is required for downstream water quality. The normal summer operating range for the lake is 0.24 m with a target operating level of 225.4 m GSD. A fall drawdown of 9 cm from September 1 to November 1 is to assist lake trout spawning and there is a maximum winter drawdown between October 15 and March 1 of 0.45 m for lake trout egg protection. Any dam operation must be coordinated between the Baysville, Port Sydney and Port Carling dams upstream and OPG must be contacted every time any log changes or generating station flow changes are made. SREL will not use the powerhouse flow to increase the maximum discharge capacity of the site.

Goal/Purpose of Dam Operation

The dam is used for flood protection, recreation, navigation, fisheries and power production purposes.

Burgess Generating Station

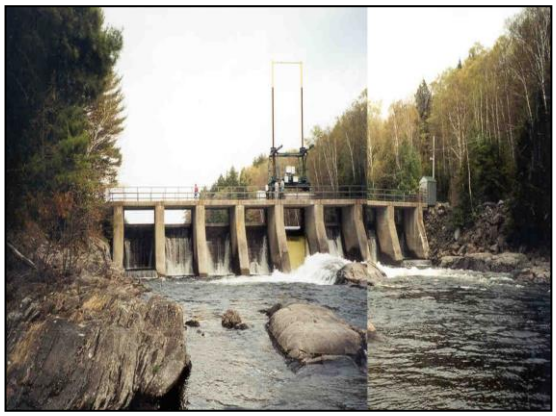


Watershed Location - The Burgess generating station, owned by Algonquin Power (Fund) Canada Inc. and operated by Algonquin Power Systems Inc., is located on the most northerly outlet from Lake Muskoka to the Bala Reach.

Structural Characteristics – The dam and powerhouse are integrated into one structure, which is situated in a constructed channel. The facility has two units.

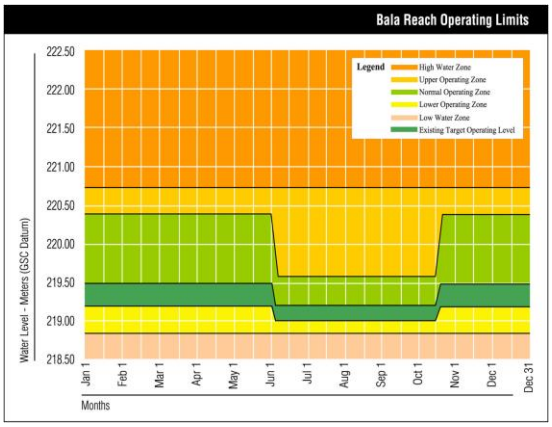
Operational Characteristics - The facility is rated at 0.14 MW, and operates when Lake Muskoka water levels are within an acceptable range. The facility has no spill capacity as upstream water level control is provided by the Bala North and Bala South dams.

Moon Dam



Watershed Location - The Moon Dam, owned and operated by OPG, is located on the Moon River less than 1 km downstream from its junction with the Musquash River. The dam stores and directs water away from the Moon River and into the Musquash to provide flow for the Big Eddy and Ragged Rapids Power plants. The dam has a drainage area of 4707 km^2.

Structural Characteristics - The dam is 8 m high, 76.5 m long and contains eight sluices.

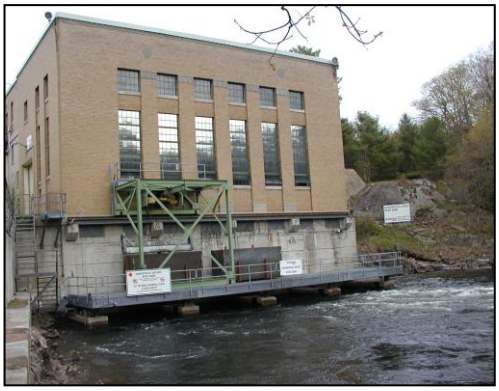


Operational Characteristics – In conjunction with the Ragged Rapids Dam and Generating Station, the Moon Dam maintains water levels in Bala Reach, and provides flow in the Musquash River for the Ragged Rapids and Big Eddy generating stations. The dam is normally closed, but opened when flows exceed 85 m^3/s (the capacity of the Musquash River plants) to progressively pass water into the Moon River. The normal summer operating range in Bala Reach is 0.27 m (219.0 m to 219.27 m GSC) and the winter range is 0.3 m (219.21 m to 219.51 m GSC). The flood damage zone occurs at elevation 220.75 m GSC, which corresponds to flows of approximately 283 m^3/s. While not a routine occurrence, flows of this magnitude can occur during the spring freshet and during severe summer or fall storm events. The Moon Chutes, a constriction in the river channel at the downstream end of Bala Reach, restricts flow above approximately 80 m^3/s, and aggravates high water levels in Bala Reach during high flows. A target flow of 14 m^3/s has generally been passed through the dam during the walleye spawning period (mid-April to June 1), although lower flows (8 to 10 m^3/s) have been targeted in recent years in an attempt to provide sustained flow throughout the walleye spawning period.

Goal/Purpose of Dam Operation

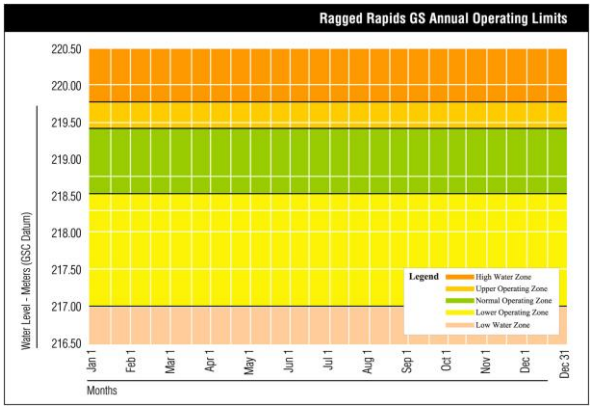
The dam is used to divert water for power production and operated to provide flow for the walleye spawning area at Moon Falls.

Ragged Rapids Dam and Generating Station



Watershed Location - The dam and powerhouse at OPG's Ragged Rapids facility are located approximately 1 km downstream from the junction of the Moon and Musquash rivers, and 6.4 km from Bala. Water discharged from the facility continues down the Musquash River to the Big Eddy GS. The upstream drainage area from the dam is 4707 km^2

Structural Characteristics - The 10 m high dam, spillway and integral powerhouse were constructed in the mid 1930's at the site of a former 9-m high waterfall. The one 6.1-m wide spillway has a sill 4.6 m below the normal water level. There are two bulkhead wingwalls with top width of 0.9m.



Operational Characteristics - The station is operated in conjunction with the Moon Dam, and is a run-of-river facility. The normal operating range is 0.92 m (218.54 to 219.46 m) with a maximum possible range of 2.77 m. Low water levels are the typical occurrence, particularly during high flow periods, as the Ragged Rapids head pond is lowered to encourage flow out of Bala Reach through the Moon Chutes. Typically a flow of 84 m^3/s is passed down Musquash River to Go-Home Lake if sufficient flows are available. The maximum flow to Go-Home Lake is restricted to 113 m^3/s to avoid flooding/high water conditions.

Purpose/Goal of Generating Station

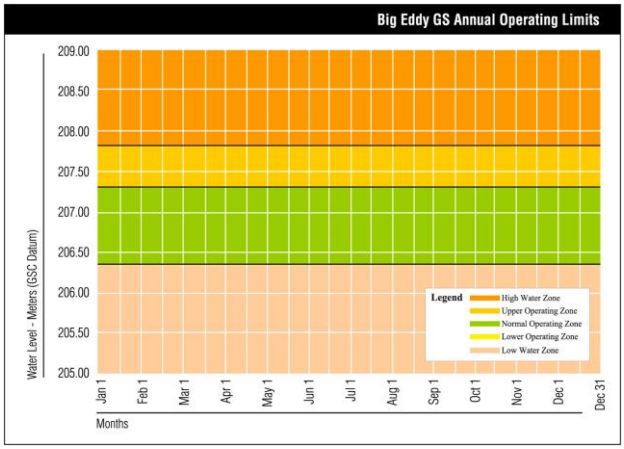
The facility is rated at 8 MW generating capacity.

Big Eddy Dam and Generating Station



Watershed Location - OPG's Big Eddy dam and generating station are located on the Musquash River approximately 7.2 km downstream from the Ragged Rapids facility. It has a drainage area of 4724 km^2. Water is discharged downstream to Go-Home Lake.

Structural Characteristics – The Big Eddy powerhouse is a duplicate of the Ragged Rapids facility. Head-pond levels are controlled by a 29-m long dam with four 4.47-m long sluiceways, which provides head at the powerhouse. There is also an 88.39-m spillwall. The facility was constructed in 1941.



Operational Characteristics - This is a run-of-river operation with no seasonal water level changes. The normal operating range is 0.95 m (207.3 m to 206.35 m GSC) with a maximum possible range of 1.47 m (to elevation 207.82 m GSC). The maximum flow into Go-Home Lake is 113 m^3/s to avoid flooding/high flow conditions on the lake. The generating station is operated in conjunction with Moon Dam and Ragged Rapids Generating Station.

Purpose/Goal of Generating Station

Big Eddy has the same generating capacity (8 MW) as the upstream Ragged Rapids facility.

Kapikog Lake Dam

This MNR dam is located at the outflow of Kapikog Lake, which flows into Healey Lake. The dam, constructed in 1967 to replace a failing beaver dam, consists of a 9-m long concrete spillway with a low-level valve that is no longer operated. The long spillwall serves to adequately maintain summer water levels for recreational purposes.

Healey Lake Dam

This MNR dam is located on Conger Creek approximately halfway between the outlet of Healey Lake and the Moon River. The dam, originally constructed in 1930, was reconstructed as a non-operable concrete weir in 1993. The weir now maintains lake levels for recreational purposes.

Go-Home Lake Dams

Two dams control the outflow from Go-Home Lake, being an operational dam at the south end of the lake at its outlet to the Musquash River, and a filter dam at the north end of the lake which discharges into the Go-Home River. The main control dam is a 5.5-m high concrete dam with four sluiceways, that is the last dam on the Muskoka River system before it empties into Georgian Bay. It was last reconstructed in 1960 and is operated to maintain lake levels for recreational purposes. The filter dam is constructed of porous rock fill, is non-operable and allows some leakage into the downstream channel.