Ontario

Madawaska River

Water Management Plan

2009









ONTARIO POWER GENERATION

Madawaska River
Water Management Plan

December 2009

The development of the Madawaska River Water Management Plan was supported and partially funded by the Ontario Ministry of Natural Resources.

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Scope of the Madawaska River Water Management Plan

This water management plan sets out legally enforceable provisions for the management of flows and levels on this river within the values and conditions identified in the WMP.

In instances where, due to emergency energy shortages, the Independent Electricity System Operator requests that owners of the waterpower facilities and associated water control structures seek relief from certain provisions of the WMP, the Ministry of Natural Resources will consider those requests expeditiously and, after consultation with the IESO, may allow short-term relief from certain provisions.

The mandatory provisions of the water management plan will be waived, as appropriate, when the dam owners (which may include other dam owners, such as MNR) are requested to do so by a police service or other emergency organization.

In instances of unscheduled facility imperatives (e.g. emergency maintenance etc.), MNR will consider requests from the owner for temporary relief from the plan expeditiously with consideration to the relative priorities of both MNR and the owner.

This plan does not authorize any other activity, work or undertaking in water or for the use of water, or imply that existing dams(s) meet with safe design, operation, maintenance, inspection, monitoring and emergency preparedness to provide for the protection of persons and property under the Lakes and Rivers Improvement Act. Approval of this water management plan does not relieve the dam owners from their responsibility to comply with any other applicable legislation.

For the purposes of this plan, an operational plan means a plan for the management of flows and levels.

Approval of this water management plan does not provide authority to flood private or public land without the consent of the owners of the affected land.

MADAWASKA RIVER WATER MANAGEMENT PLAN

Madawaska River Watershed Waterpower Producers and the Ontario Ministry of Natural Resources, Pembroke District, Southern Region For the ten-year period from December 2009 to December 2019

In submitting this plan, I declare that this water management plan for waterpower has been prepared in accordance with the *Water Management Planning Guidelines for Waterpower*, as approved by the Minister of Natural Resources on May 14, 2002.

Jim Moreland, Ontario Power Generation — Date: April 15 2010
I have authority to bind the corporation

David Fraser, Fraser Power — Date: Apr. 19/2010
I have authority to bind the corporation

Lyle Stewart, Misty Rapids Power — Date: April 16 2010
I have authority to bind the corporation

George Barrie, Barrie Small Hydro Limited — Date: APRIL 16 2010
I have authority to bind the corporation

I certify that this water management plan has been prepared in accordance with the *Water Management Planning Guidelines for Waterpower*, as approved by the Minister of Natural Resources on May 14, 2002, and that direction from other sources, relevant policies and other obligations have been considered. I recommend this plan be approved for implementation.

Paul Moreau, District Manager, Pembroke District — Date: April 19, 2010
Ontario Ministry of Natural Resources

Approved by: Carrie Hayward, Regional Director, Southern Region — Date: April 21, 2010
Ontario Ministry of Natural Resources

In 1994, MNR finalized its Statement of Environmental Values under the Environmental Bill of Rights. The Statement of Environmental Values is a document that describes how the purposes of the EBR are to be considered whenever decisions are made in the ministry that might significantly affect the environment. During the development of this water management plan, the ministry has considered its Statement of Environmental Values.

I. Acknowledgements

The successful completion of the Madawaska River Water Management Review, Final Report (WMP 2000) could not have happened without the support, dedication, participation and commitment of Ontario Power Generation (OPG), the Ontario Ministry of Natural Resources (MNR), the Steering Committee, Working Group, and Public Advisory Committee (PAC). It is important to acknowledge their contributions to a project that at the time, was unique to the Province of Ontario - two agencies, one a utility and the other the regulator, working together toward a common goal: the development of a water management review that would balance the interests of both parties, and address the needs of the local community.

The Madawaska River Water Management Review became the model of for water management planning in the province of Ontario.

In August of 2000, a Standing Advisory Committee (SAC) was formed to monitor the implementation of the water management plan. Their dedication throughout the years of implementation, and subsequently their significant contribution to the updated Madawaska River Water Management Plan (WMP 2009), has been exemplary. The terms of reference for the SAC can be found in Appendix C.

Municipal leaders, landowners, and members of the public also contributed during the planning process by providing feedback through open house public consultation sessions and general mailouts.

MNR made a significant contribution to the plan, co-leading the process with OPG, providing land-based data and mapping resources, staff time and financial support.

OPG, the waterpower producer on the Madawaska River, co-led the update of the WMP 2000, providing important data and flow and level management, significant staff time, and financial and technical assistance during the planning process.

Other waterpower producers in the watershed provided technical assistance during the update of the WMP.

Thanks to Don Ferko and Joanna Samson, principal authors on this water management plan, to Doug Skeggs for English edits and for co-ordinating the publication process, Amy Cameron, Karen Handford, Jennifer Gardiner, Linda Halliday and Mike Radford for their thorough and invaluable review of the draft plan, Treena Hein for her professional proof-read, and to Rebecca Nolan and Kent Tubman of Tubman Marketing for design and layout.

II. Technical Terms, Units of Measure, Abbreviations and Typographical cues in this publication

It is unavoidable that a publication of this nature, because it includes descriptions of complex inter-related systems, also includes some technical terms, concepts and abbreviations that may not be immediately understood by the reader.

We have included a glossary of terms (Section 11) in this plan, providing definitions for all technical terms. The words referenced in the glossary appear in italics on first reference in the plan.

For ease of reading, we are abbreviating some terms and proper names for programs or agencies. On first reference, these terms and names are spelled out followed by the abbreviation in brackets. Uncommon abbreviations are also included in Section 12.

Metric units are used throughout this document. However, the water level at some dams are still operated to and reported in imperial units to the tenth of a foot. Imperial units are used at a dam if the management of the water level is carried out in imperial units.

A note on the presentation of data in the document: Numerical data relating to levels and flows is presented to one or two decimal places. The apparent discrepancy is a result of three factors:

1. The different measurement precisions of the various gauges and recording instruments used since readings were first taken on the river system.
2. Inaccuracies accrued, including round off error, in the conversion of imperial units of measure to metric units of measure.
3. Variances in the number of decimal points of readings actually recorded (often manually recorded) since readings were first taken on the river system.

III. Context

The Madawaska River flows 270 km from its headwaters in Algonquin Provincial Park to the Ottawa River at Arnprior. Its drainage area covers over 8500 square kilometres. The river supports a range of uses, from generating electricity and flood control, to a significant amount of recreational and tourism activities. MNR has operational responsibilities for several dams. OPG operates several major storage and hydroelectric facilities on the river. MNR administers the legislation that provides rights to flood Crown land and use water resources.

The goal of the water management review, approved in May of 2000, was to develop a water management plan for the Madawaska River and ensure public awareness of the plan. A by-product of communicating the plan results was an improved communications process between the two organizations, local clients, stakeholders and the public.

The main focus was on the river itself, water levels and flows and how these affect the aquatic ecosystem and other uses. The review was to be carried out keeping ecosystem, watershed and resource use perspectives in mind while ensuring long term opportunities for broad public involvement in the river's management.

A process for continued public involvement was developed in conjunction with the review. The SAC was formed in August of 2000 to monitor the implementation of the water management plan. The mandate of the SAC is to provide a mechanism for the public to contribute to the implementation of the plan and to follow the implementation progress. OPG and MNR staff continue to be involved with the information needs program and amendments to the water management plan. The SAC is also responsible for bringing any new problems and issues to the two agency representatives. In May 2002 they produced the First Annual Report for 2001 and similarly, in June 2003, the Second Annual Report (2002) was produced and in November 2004, the third annual report (2003) was issued. The original review document called for a five-year report of the plan's implementation, which was completed in May 2006.

The Water Management Planning Guidelines for Waterpower were approved in May 2002. In order to meet the requirements of existing and new legislation and regulations, there are components to the guidelines that needed to be incorporated into the Madawaska River Water Management Review document. As a result, the WMP 2009 has been developed to conform, wherever possible, to the guidelines.

The guidelines stipulate that all existing waterpower facilities and any other water control structure on a river system will be involved in the water management planning process. As a result, the WMP 2009 incorporates the addition of Waba Creek, a tributary of the Madawaska River. This new reach includes an MNR dam and the three private waterpower facilities. Bancroft Light and Power, a waterpower producer on the York River, is also included in this plan although a Simplified Water Management Plan already exists for this facility.

The SAC played a key role assisting the Working Group and Steering Committee in the development of the WMP 2009. Please refer to Table 1 for a list of the current planning team members.

The MNR and OPG share a commitment to sustainable development. In both the 2000 and 2009 water management plans, sustainable development is defined as a water management regime that results in a balance among a range of natural heritage, social and economic values and uses for the benefit of present and future generations. It is anticipated that this balance can be achieved through a commitment on the part of the agencies through maintaining the following goals:

1. Sustaining and enhancing the river's aquatic ecosystems and biological diversity
2. Generating electricity safely, efficiently, reliably and economically (at competitive prices) while making a reasonable effort to ensure that the economic well-being of other stakeholders is considered
3. Supporting a range of recreational and tourism uses
4. Fostering greater public awareness and understanding of the river as an interconnected system
5. Being cooperative and maintaining improved levels of communications
6. Working in partnership with individuals and groups

Table 1: Planning Team Organization

Working Group
Waterpower Producers: OPG: Don Ferko, Chris Tonkin, Linda Halliday, Jerry Lapierre, Jennifer Gardiner Waba Creek: David Fraser, Lyle Stewart, Jeff Barrie Bancroft Light and Power: Mike McLeod
Government Agencies: MNR: Joanna Samson, Paul Moreau, Karen Handford, Al Hyde, Kirby Punt, Nick Paroschy, Terry McLeish, Henry Checko, Craig Dodds, George Oram, Dale McHenaghan DFO: Mark Scott
Standing Advisory Committee
Steve Roy, Damian Hanel, Brian Wright, George Newton, JP de Grandmont, Lucien Lacombe, Dan White, Brian Moran
Steering Committee
Waterpower Producers: Chris Tonkin, Jim Moreland, Lyle Stewart MNR: Paul Moreau, Ray Bonenberg

1 INTRODUCTION

The headwaters of the Madawaska River flow out of a network of streams and lakes in the southeast corner of Algonquin Provincial Park (Figure 1.01). The river cuts its way across the Precambrian highlands of the Canadian Shield in its 270-kilometre journey to its confluence with the Ottawa River at Chats Lake near Arnprior.

Over its length, the river drops 350 meters. Most of the vertical drop occurs between Bark Lake and Arnprior. The total drainage area is over 8500 square kilometres.

For the purposes of this plan, the Madawaska River is organized by tributary and further divided into a series of reaches or sections. The main tributaries are the:

- Madawaska River
- Opeongo River
- York River
- Waba Creek

OPG owns five hydroelectric generating stations and four dams on the Madawaska River and on Mackie Creek (a small tributary).

MNR operates a number of dams on the Madawaska River, Opeongo River, York River, Waba Ceek and other tributaries.

Bancroft Light and Power operates a hydroelectric generating station on the York River in the Town of Bancroft.

Fraser Power, Misty Rapids Power, and Barrie Small Hydro, each operate a hydroelectric generating station on Waba Ceek.

Within this plan, dams that produce hydroelectric power are referred to as a hydroelectric generating station (GS).

Managing flows and levels on a system like the Madawaska always involves balancing different and sometimes competing values and objectives, such as electricity production, protection of fish and wildlife, the needs and interests of shoreline property owners, and a variety of other interests and users.

For many reasons (topography, local land uses, historic practices, and other limitations or unique characteristics), adjacent reaches are not always managed in the same way. And, the management of one reach may directly impact the levels and flows of other reaches up and downstream.

1.1 MADAWASKA RIVER WATER MANAGEMENT, FINAL REPORT (WMP 2000)

The Madawaska River Water Management, Final Report (WMP 2000) was published in January 2000. The WMP 2000 was prepared as a result of an agreement between the MNR and OPG in June 1995, to form a partnership to conduct a review of water management of the Madawaska River.

The WMP 2000 was a significant step for several reasons:

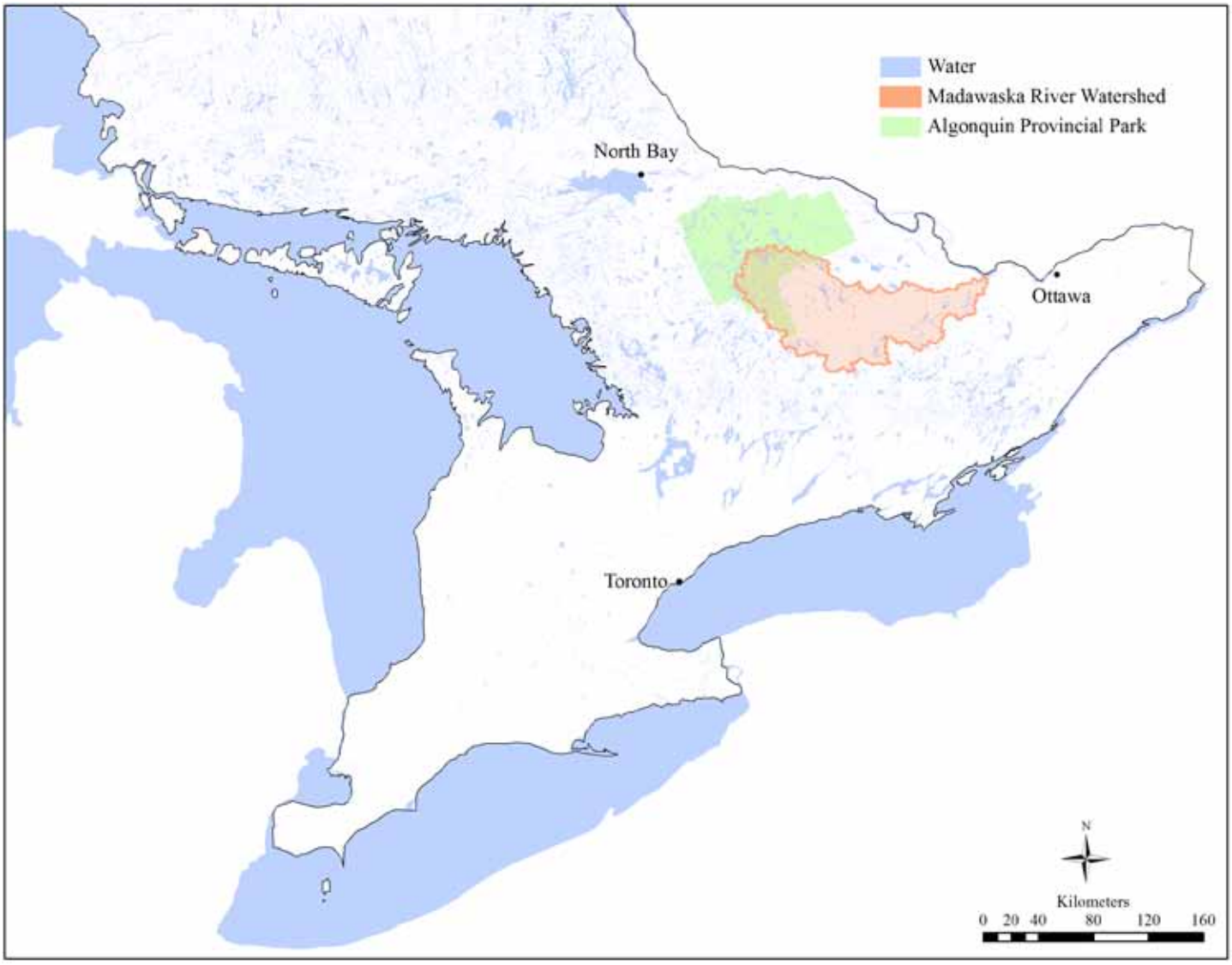
1. It aimed to apply several developing concepts of interest to both organizations: sustainable development, water management planning, and an ecosystem approach to management.
2. It involved water planning on the entire Madawaska River system.
3. It involved public information and participation as a key element of water management planning.
4. It strived to develop management approaches that are cost-effective, building on experiences elsewhere in the province.
5. It would improve communication and cooperation between water management operations of MNR and OPG.

The goal of the WMP 2000 was to develop a water management plan to guide water levels and flows for the Madawaska River and ensure public awareness of the plan. The plan identifies operational criteria for MNR and OPG structures. It was intended and designed to be a work in progress that captured only the current limitations.

Public participation and consultation was instrumental to the WMP 2000. PAC was selected that provided advice and direction to the inter-organization team. Three phases of Public Consultation were undertaken, involving focus groups and open houses.

In August 2000, SAC was formed to monitor the implementation of the water management plan. The SAC is made up of citizens representing a diversity of interests, whose mandate is to provide a mechanism for the public to contribute to the implementation of the plan, follow the implementation progress, and be aware of issues and proposed changes to the plan. It has been the role of the SAC to bring any new problems and issues to MNR and OPG throughout the implementation of the plan.

Figure 1.01: Madawaska Watershed



The WMP 2000 document called for a five-year report on the status of the plan implementation. The report, finalized in May 2006, summarized the items that the SAC monitored over the first five years of implementation.

1.2 MADAWASKA RIVER WATER MANAGEMENT PLAN UPDATE (WMP 2009)

Hydroelectric power has been produced in Ontario for more than 150 years and has contributed significantly to the economic health of the province. There are about 200 hydroelectric generating stations in Ontario, owned and operated by over 83 different producers (MNR, 2002). Hydroelectric generating stations contribute about 26 percent of the province's total generating capacity.

The government of Ontario moved to restructure Ontario's electricity market with Bill 55 (Energy Competition Act) which was passed in 1998. In May 2000, the government endorsed a "new business relationship" with Ontario's hydroelectric producers including, among other things, a requirement that formal plans for the management of flows and levels be prepared for the province's hydroelectric GSs.

In December 2000, the Lakes and Rivers Improvement Act (LRIA) was amended to provide the Minister of Natural Resources the authority to require Ontario's hydroelectric GS owners, and any other dam owners on rivers with one or more hydroelectric GS, to prepare water management plans in accordance with the guidelines approved by the Minister. This authority was expanded and new penalty provisions were added to the LRIA in June 2002. The Water Management Planning Guidelines for

Waterpower (WMPG) were approved by the Minister in May 2002.

The opening of the Ontario Electrical Market in 2002 changed the mechanism of operation for power production facilities in the province. Four of the five hydroelectric GSs on the Madawaska River were required to participate in an open market and follow dispatch instructions from the Independent Electricity System Operator (IESO). The mechanism of operating in the new market changed OPG's ability to manage flows and levels by introducing greater uncertainty. In 2007 the IESO introduced a change to the market mechanisms which can reduce uncertainty under certain conditions.

The WMP 2000 was instrumental in leading the way for the approval of the WMPG in 2002. However, in order to meet the requirements of existing and new legislation and regulations, there are components of the guidelines that need to be incorporated into the WMP 2000 document.

This document is an update of the WMP 2000. It incorporates the information contained in the WMP 2000, new information derived from the implementation of the original plan, and new components to bring the plan into compliance with the WMPG (2002). For example, this update incorporates:

- issues and responses, information needs, and operation criteria for MNR dams and OPG dams and GSs as identified in the WMP 2000
- updates to issues, action items and information needs, as well as new issues and information needs identified during implementation of the WMP 2000
- components such as an Effectiveness Monitoring Plan, a Compliance Monitoring Plan, the addition of all MNR dams in the Madawaska River watershed, and the incorporation of dams and GSs on both Waba Creek and on the York River

This plan is divided into ten main sections. This first section provides information on the evolution of the WMP and the terms, as well as the amendment, issue and dispute resolution processes which will govern the WMP. Section 2 contains a brief overview of the unique characteristics of the watershed. Section 3 contains a brief socio-economic description of the various uses of the river. Section 4 contains a general description and history of the dams currently in place. Section 5 contains a list of issues and responses related to level and flows through the WMP process since 1995. Section 6 contains a list of the key gaps developed from section 5. Section 7 contains a list of completed or pending information needs which are derived from issues in section 5. Section 8 contains details about the options developed to resolve some issues. Section 9 contains information about the operating plan and compliance framework including the flow and level limits at each facility. Section 10 contains details of the effectiveness monitoring which will be used to determine if the WMP are producing the expected or desired results.

The link between sections 5 through 9 are not always straightforward in that they proceed through each section. Most issues from section 5 have already been dealt with and thus do not appear as a key gap in section 6. All key gaps in section 6 are derived from section 5. However, not all issues are key gaps. Section 6 is limited to existing gaps which have not been dealt with. The majority of issues documented in section 5 require further investigation, research or information before they can be resolved and thus they have an information needs that appears in section 7. Section 8 is limited to the issue from section 5 which developed into a few options for resolution. Not all issues proceeded to an option development phase. Only the options developed since the WMP 2000 are document in section 8. Section 9 contains flow and level limits at each facility with many derived from an issue identified in Chapter 5 and many developed prior to the WMP.

1.3 GOAL AND GUIDING PRINCIPLES OF WATER MANAGEMENT PLANNING

The goal of water management planning is to contribute to the environmental, social and economic well-being of the people of Ontario through the sustainable development of waterpower resources and to manage these resources in an ecologically sustainable way for the benefit of present and future generations. This is achieved through the management of water levels and flows as they are affected by the operations of GS and dams.

The following principles guide the preparation, approval and implementation of WMPs:

- Maximum net benefit to society – WMPs should attempt to maximize the net environmental, social and economic benefits of hydroelectric operations.
- Riverine ecosystem sustainability – WMPs should, at a minimum, arrest any on-going degradation of the riverine ecosystem resulting from the manipulation of water levels and flows, and should seek to improve the ecosystem.
- Planning based on best available information – Planning should proceed based on the most recent

and best quality information that is available at the time of decision-making.

- Thorough assessment of options – A sound assessment of the possible options for the management of water flows and levels requires a thorough and open WMP 2000. Tradeoffs among options should consider their qualitative and quantitative environmental, social and economic benefits and costs.
- Adaptive management – Planning will use this long-term management process that strives to continually improve resource management, to reduce areas of uncertainty, build on successes and make adjustments to limit failures.
- Timely implementation of study findings – Information that arises after a WMP has been approved should be addressed and implemented in a timely manner.
- Aboriginal and treaty rights – Water management planning will be undertaken without prejudice to the rights of Aboriginal people and treaty rights.
- Public participation – WMPs will be developed using open and transparent processes and will be built on consensus-based decisions.

1.4 PLAN GOALS AND OBJECTIVES

A water management plan for the Madawaska River must address many public interests. Among these are ensuring public safety, maintenance of the aquatic ecosystem, providing for hydroelectric generation, and other uses.

The goal is:

To develop and update an inter-organization (OPG, MNR, Misty Rapids Power, Fraser Power and Barrie Small Hydro, Bancroft Light and Power) water management plan for the Madawaska River that is in conformity with the WMPG (2002) and to communicate it to the public.

The objectives are to:

1. Review existing water management by OPG and MNR from an ecosystem, watershed and resource use perspective
2. Review issues identified over the past nine years of implementation
3. Conform the WMP 2000 to the WMPG (2002)
4. Provide long-term opportunities for broad public involvement in the river's management
5. Produce a comprehensive water management plan for the river.

The main competing uses for water management in the Madawaska River are:

- Hydroelectric generation
- Flood control
- Recreation and tourism
- Fish and aquatic ecosystems

1.5 PLANNING PROCESS AND PLANNING TEAM STRUCTURE

The planning process involved in the development of the WMP 2000 and the WMP 2009 was a collaborative effort. This document reflects the solutions that have been developed by the members of the Public Advisory Committee, SAC, the Madawaska River Working Group and Steering Committee for the WMP 2000 and the Full Working Group for the WMP 2009.

The current Full Working Group is composed of representatives from MNR, Ontario Parks, Department of Fisheries and Oceans, OPG, Bancroft Light and Power, Misty Rapids Power, Fraser Power and Barrie Small Hydro. See Table 1 for a schematic of the planning process for the current document.

There are three broad stakeholders with an interest in the management of flows and levels on the Madawaska River:

- Landowners and the public
- Regulatory agencies
- Hydroelectric power producers

Landowners and the Public

The broad stakeholder group referred to as the public, includes local landowners, residents on the watershed, and the general public of Ontario. The PAC and SAC represented the interests and issues of this group during the planning processes. Members of the PAC were recruited through a selection process facilitated by MNR and hydroelectric power partners during the planning stages for the WMP 2000 Document.

For the purpose of this document, the SAC, recruited through a selection process in 2000, has acted in the role of a Public Advisory Committee by advising the Full Working Group of any issues and possible solutions that have been raised during the nine years of implementation. In addition, the SAC continues to help in planning and implementation of communications and public consultation.

Regulatory Agencies

Through the LRIA, MNR is the public agency responsible for water management planning in Ontario with a vision of sustainability. Section 23.1 of the LRIA applies specifically to water management planning.

MNR also has a role in involving other agencies that may have an interest or a regulatory mandate on the watershed (for example the Ontario Ministry of the Environment, Department of Fisheries and Oceans Canada).

Waterpower Operators

OPG is the sole GS operator on the Madawaska River. Misty Rapids Power, Fraser Power and Barrie Small Hydro each operate a single GS on Waba Creek. Bancroft Light and Power operate a waterpower facility on the York River. All five hydroelectric power operators are involved in generating electricity for profit.

1.6 PUBLIC CONSULTATION REPORT

As previously stated, public participation and consultation was instrumental to the WMP 2000 report. In addition to the formation of a PAC that provided advice and direction to the inter-organization WMP 2000 team, a number of public consultation opportunities were presented during the four formal phases of the plan development. Details of the phases, and the public consultation (including open houses and a focus group session) are outlined in the WMP 2000 document.

The SAC was formed in August 2000 to oversee/ monitor the implementation of the WMP 2000. The SAC have provided a continuous mechanism for the public to comment and bring forward any new problems and issues to the agency representatives. In May 2002 the SAC produced the First Annual Report for 2001, followed by the Second Annual Report (2002) in June 2003, and the third (2003) in November 2004. The annual reports are public documents and are available from OPG and MNR.

The WMP 2000 called for a five-year report on the status of the plan implementation. This report summarizes the SAC activities, successes and accomplishments, a progress report on the information needs and new issues that arose during the implementation. The report was developed by MNR and OPG with the assistance of the SAC.

In September 2005, the Madawaska River WMP mailing list was expanded to incorporate additional stakeholders including the adjacent property owners on White Lake and Waba Creek. A letter was sent to all individuals on the mailing list outlining the planning process to update the WMP 2000 document to conform to the WMPG (2002). Individuals interested in taking part in the process were asked to submit their names. A posting on the Environmental Bill of Rights (EBR) environmental registry accompanied the mailout.

In December 2006, a letter was sent to the mailing list with respect to the operations of the White Lake Dam. There are three small GSs on Waba Creek and they rely on the regulated flow from the White Lake Dam. The letter outlined a number of improvements to the White Lake Dam Operating Plan. The public input received assisted in decision-making. Please refer to section 9.6.1 for further information regarding the operation of the White Lake Dam.

An opportunity for public input regarding the draft WMP 2009 was provided in August 2009. A notice of the opportunity for the public to inspect the draft plan was sent to interested stakeholders, and newspaper advertisements were issued. As a part of this consultation, the draft WMP was posted to the EBR registry for a 30 day public review and comment period.

Upon approval of the WMP 2009, a public inspection period was provided.

For further information on the record of public consultation, please see Appendix D.

The water management plan will be formally reviewed every 10 years.

Table 1.01: The Madawaska River Water Management Planning Process (WMP 2009)

	2005			2006			2007			2008			2009												2010					
	J-A	M-A	S-D	J-A	M-A	S-D	J-A	M-A	S-D	J-A	M-A	S-D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Approval of Terms of Reference by Steering Committee																														
Contact & Information Sharing with Waba Waterpower Producers																														
Orders Issued to all Waterpower Producers																														
Update of Mailing List (White Lk & Waba)																														
EBR Registry Posting & Mailout Comment Period, Initial Notice																														
New Components of Draft Plan Developed																														
Components Reviewed by SAC																														
Focused mailout / Consultation, Waba Reach																														
Draft Plan Compiled / Prepared / Publisher																														
Public Open House Sessions to Review Draft Plan, EBR Registry Posting & Mailout																														
Editing / Review of Draft Plan																														
SAC Approval of Plan																														
Working Group Review of Final Draft																														
Draft Plan Approved and Submitted by Steering Committee																														
Government Review of Draft Plan																														
Final Edit																														
Recommended Final Plan Submitted to District Manager & Regional Director for Approval																														
Approved Madawaska River WMP																														
EBR Registry Posting & Mailout - Notice of Inspection of Approved Plan																														

1.7 FIRST NATIONS INVOLVEMENT

Water management planning in Ontario is undertaken without prejudice to the rights of Aboriginal people and treaty rights. It is MNR's responsibility to facilitate and participate in consultations with First Nations.

The entire watershed of the Madawaska River is within the traditional territory claimed by the Algonquins of Ontario.

An opportunity for input into the draft Madawaska River Water Management Plan was provided prior to and concurrently with the public consultation opportunity with the appropriate Algonquin Negotiation Representatives. The summary of communication with First Nations is in Appendix G.

1.8 ISSUES AND RESPONSES

Through the consultation process for the initial review process (2000) and the nine years of WMP implementation, a series of issues were identified. These issues were an important product of the review process and form a critical part of the water management plan. Identification and analysis of issues provides an opportunity to achieve collaborative results. These results are intended to ensure that all values on the river system are considered in the development and implementation of flow and level regimes.

Each of these issues has been discussed and analyzed in the review process and in the development of this water management plan. Each issue has been addressed through one or more of the following actions:

- a written response
- a direct action
- identification of an information need (Section 7) & status

Some issues have a combination of the above actions associated with them, for example a written response and a direct action.

Issues and responses are documented in section 5 along with the identification of the associated information need in section 7. Key incomplete information needs that are developed from section 5 are listed in section 6. All information needs (completed and incomplete) are contained in section 7. Issue that developed into an option with or without a information need and since the publishing of the WMP(2000) are contained in section 8.

1.9 PLAN TERM, REVIEW, AND AMENDMENTS

This plan has a term of ten years, from December 2009 to December 2019. The next plan review will commence no later than December 2017. Subsequent reviews of the plan will be carried out as required and as determined by MNR and the dam owners. The review will involve full public consultation through public notices, consultation sessions, open houses and EBR postings where required.

An unscheduled plan review may be required at any time if an issue develops that justifies a comprehensive reassessment of the whole plan.

For any change to an approved WMP, an amendment is required. As stated in the WMPG (2002), amendments to the WMP can be made during the term of the plan provided the outcomes remain consistent with the goals and objectives of the WMP. Alterations to the goals and objectives require that the plan development process be followed. The SAC will review new information as it is gathered and provide advice. If new information indicates that operating regimes need to be adjusted, MNR will issue an order to amend the WMP if required.

Amendments to this WMP can range from simple text corrections to changes requiring comprehensive planning, and public and Aboriginal consultation. To address a wide variety of potential amendments, three categories of amendments are provided:

- administrative
- minor
- major

The requirements associated with any amendment depend on the nature of the amendment. Opportunities for public and Aboriginal consultation differ depending on the category of amendment. The SAC has an opportunity to comment on all plan amendments.

The amendment process generally involves:

a) submission of a request for an amendment to the MNR District Manager

b) review of the request by MNR staff, with advice from the SAC in terms of recommendation and categorization of the amendment

c) acceptance or denial of the request by the Regional director

d) if accepted, assignment of a category to the amendment by the Regional director

e) completion of all applicable planning requirements, including public consultation, and Aboriginal consultation

f) MNR review and regional director decision on the amendment

g) record-keeping requirements

1.9.1 Amendment Request

Any request must be accompanied by sufficient information to allow the MNR regional director to determine whether the proposed amendment should proceed, and whether the amendment should be treated as administrative, minor or major.

The amendment request must contain the following information:

- a brief description of the proposed amendment
- the rationale for the proposed amendment and a discussion of its significance
- if new operations are proposed:

  - a brief description of the proposed operations, and a description of the previously approved operations in the WMP which will be changed by the proposed amendment

  - an outline of the applicable planning requirements for the proposed operations, including public consultation, based on the planning requirements for similar operations in a WMP

Any amendment request that is not accompanied by sufficient information to allow the regional director to determine whether the amendment should proceed, and assign the appropriate amendment category, will be returned to the amendment proponent with a request for additional information.

1.9.2 Review of Amendment Request and Categorization

Once an amendment request is received, MNR staff complete an initial review to assess whether sufficient information is provided and whether the request can proceed through the amendment process.

Once the initial review is complete, the proposed amendment goes to the SAC for a review and recommendation on the amendment and its categorization.

MNR regional director is responsible for determining whether an amendment should proceed, and for categorizing the amendment as administrative, minor or major. In making this determination, the regional director will determine the appropriate level of public consultation, and MNR review and approval required.

The regional director considers the following factors in determining whether to grant the request for an amendment, and in determining the appropriate category:

- Review advice from the district manager and SAC regarding their recommendation on and categorization of the requested amendment
- whether there are legitimate time constraints which must be met for reasons of public safety, biological or industrial necessity, or public convenience and necessity
- whether there has been previous notification that the requested amendment will be required, and the degree to which planning and public consultation has taken place previously (e.g. decisions deferred in the water management plan; amendments required after public consultation in other planning processes)
- the adequacy of the information concerning the resource features, land uses and values potentially affected and the anticipated potential effects of the requested operations
- the number of previous requests for similar amendments
- consistency with the goals and objectives of the approved WMP

If the regional director determines that the amendment is a matter of urgency, the regional director will immediately approve the amendment request.

The decision on the amendment request, and the appropriate category of amendment, will normally be made within 45 days of receipt of the request depending on a number of variables, including the completeness and complexity of the request and the availability of the SAC. The MNR regional director will prepare a written decision, and any disagreements with the categorization of the amendment will be recorded in that written decision.

1.9.3 Administrative Amendments

If the MNR regional director decides that a proposed amendment should proceed, and that the appropriate category of amendment is administrative, the MNR regional director will approve the amendment when the necessary planning has been completed. (Note: There

are no formal public consultation requirements for the preparation of an administrative amendment.)

Documentation requirements for administrative amendments include:

- the amendment request
- replacement text for the changes to the approved water management plan
- a map of the area affected by the amendment, if applicable
- all documentation associated with the planning of operations, if applicable, including any associated supplementary documentation
- recommendations from the SAC

1.9.4 Minor Amendments

If the MNR regional director determines that a proposed amendment should proceed, and that the appropriate category of amendment is minor, one formal public consultation and Aboriginal consultation opportunity will be provided. At least 15 days prior to a final decision on approval of a minor amendment, the MNR regional director will issue a Notice of Minor Amendment Inspection which indicates that the proposed minor amendment is available for inspection at the appropriate MNR area or district office.

The notice will normally contain the following information in concise non-technical language:

- a statement that the proposed minor amendment will be approved by a specified date unless concerns are raised
- a statement that further public consultation may be required if concerns are raised
- a map of the river reach/area for which the amendment is being prepared
- a description of the subject matter of the proposed amendment
- the method by which the public may obtain additional information on the proposed amendment
- a request for comments
- the names of appropriate contact people
- a brief explanation of how comments received will be dealt with according to the relevant provisions of the Freedom of Information and Protection of Privacy Act
- a statement of the relevant opportunities for resolution of issues

The French Language Services Act, as amended from time to time, will govern the provision of French language services for public consultation in the preparation of a minor amendment.

If the response to the public notice indicates no significant concerns, or if concerns can be resolved with no substantial change to the proposed amendment, the MNR regional director will approve the amendment.

If the response to the public notice indicates significant unresolved concerns about the proposed amendment, the amendment request will be re-categorized as major, unless the MNR regional director determines that the objection is unreasonable or that the amendment is a matter of urgency. In the latter case, the MNR regional director will approve the amendment.

If an issue arises during the preparation and review of the minor amendment, the issue and dispute resolution procedure described in Section 1.9.7 will apply, with whatever modifications are necessary in the circumstances.

Documentation requirements for minor amendments include the same requirements as for administrative amendments (see Section 1.9.3), as well as documentation of the results of the formal public consultation opportunity for inspection of the amendment.

1.9.5 Major Amendments

If the MNR regional director determines that a proposed amendment should proceed, and that the appropriate category of amendment is major, formal public consultation opportunities will be provided at two stages. MNR staff will ensure that local Aboriginal communities are contacted and considered early in the amendment process to assess and discuss their potential interest in the amendment.

Public notices will be issued by the MNR at each stage of the public consultation process.

Notices will normally contain the following information, in concise non-technical language:

- a statement of the purpose of the notice and the public consultation opportunity
- a map of the river reach/area for which the major amendment is being prepared
- a description of the subject matter of the proposed amendment

- the particulars and schedule for any additional formal public consultation opportunities
- the method by which the public may obtain additional information on the proposed amendment
- a request for comments
- the names of appropriate contact people
- a brief explanation of how comments received will be dealt with according to the relevant provisions of the Freedom of Information and Privacy Act
- a statement of the relevant opportunities for resolution of issues

The French Language Services Act, as amended from time to time, will govern the provision of French language services for public consultation in the preparation of a major amendment.

Stage one of the public consultation process for major amendments will begin by issuing a Notice of an Information Centre, at least 30 days before the date of the information centre. At the same time as the Notice of an Information Centre is issued, the provisions of the EBR, as amended from time to time, require that MNR place a notice on the EBR's Environmental Registry.

A 30-day period is provided after the information centre for interested persons to provide comments on the proposed amendment. The required documentation for the major amendment is then produced and submitted to MNR for review. After the review, the major amendment will be approved by the MNR regional director.

Stage two of the public consultation process for major amendments will begin by issuing a Notice of Major Amendment Inspection. This notice will be issued upon MNR approval of the major amendment, and will provide direction on how to obtain access to the major amendment documentation. At the same time as the Notice of Major Amendment Inspection is issued, the provisions of the EBR, as amended from time to time, require that MNR place a notice on the EBR's Environmental Registry.

If an issue arises during the preparation of a major amendment, the issue resolution procedure described in (Section 1.9.7) will apply, with whatever modifications are necessary in the circumstances.

Documentation requirements for major amendments include the same requirements as for administrative amendments (see Section 9.1.3), as well as documentation of the results of public consultation. A brief description of how MNR's Statement of Environmental Values (SEV) under the EBR, as amended from time to time, has been considered in the development of the major amendment must also be produced, in the form of an SEV briefing note.

1.9.6 Amendment Records and Distribution

All approved amendments will form part of the approved water management plan. A copy of each approved amendment will be filed with the approved water management plan at the appropriate MNR district office immediately upon approval. A record of all amendment requests and all approved amendments will also be maintained.

1.9.7 Issue and Dispute Resolution

Anyone with an interest in the management of flows and levels on the Madawaska River may raise an issue through the following issue and dispute resolution process.

a) The concerned person must identify the issue with the waterpower industry representatives, preferably in writing, and offer a proposed solution.

b) The waterpower representative(s) will meet with the concerned person to attempt to resolve the issue. If they do not, the representative(s) will communicate the issue in writing to the lead MNR District Manager and the SAC.

c) The District Manager will arrange a meeting with the waterpower representative(s), the concerned person, and one or more SAC members to discuss possible solutions.

d) If the meeting does not produce a solution, the waterpower representative(s), the concerned person, and the SAC will be asked to recommend a solution, normally within 30 days, and the District Manager will normally make a decision in a further 30 days.

e) If the concerned person and/or the waterpower representative(s) are dissatisfied with the decision, a request may be made for a review by the MNR regional director, who will carry out and render a decision, normally within 30 days.

2 THE MADAWASKA RIVER WATERSHED

The purpose of this section of the Madawaska River WMP is to provide a brief overview of the unique characteristics of the watershed. The watershed and the river have evolved over time and will continue to change in the future. It is important to recognize that human activity and direct intervention have altered the flows and levels on the river and its tributaries.

Interactions of climate, geology, land use, physiography, vegetation and soils produce the water flow within a river (Knighton, 1984). Dam and hydroelectric operations have the effect of altering flows and levels within the various reaches of a river. The flows and levels on the Madawaska River are the product of a series of complex interactions between the unique characteristics of the watershed and the evolving direct human interventions at dams and hydroelectric facilities and additional human-induced indirect changes to the landscape.

The level and flow regime created as a result of the operation of the dams and hydroelectric facilities is the main focus of the Madawaska River WMP. Changes to the level and flow regime can have impacts on the aquatic ecosystem, as well as on other values and human uses of the river.

This section of the plan is divided into five sub-sections. A brief overview of the climate, geology, land use, physiography, vegetation and soils are described in the first sub-section. The remaining four sub-sections describe the cultural history, hydrology, aquatic ecosystem and Ecological Site Regions. The level and flow regime is the focus of the brief overviews within this section.

2.1 WATERSHED ENVIRONMENTAL CONTROLS

A brief overview of the climate, geology, land use, physiography, vegetation and soils is presented below.

2.1.1 Climate

Climate is the main factor that influences levels and flows as it provides the main source of water which drains through the watershed. Data from four climate stations are used to quantify the spatial and temporal variability of precipitation on the watershed. The stations are:

- Combermere (6101820)
- Ottawa Airport (6106000)
- Petawawa National Forestry (6106400)
- Muskoka Airport (6115525)

The Petawawa National Forestry Station is not currently active. Records for this station end in 1999. The Combermere station is the only active climate station within the basin that has long term records, with published records for the years 1956 to 2003. The other stations provide an indication of the variability that surrounds the watershed. The annual variability of precipitation at the four climate stations is shown in Table 2.01.

Table 2.01: Annual Precipitation

Station	Annual Precipitaion (mm)		
	Minimum	Average	Maximum
Combermere (6101820)	651	847	1026
Ottawa Airport (6106000)	621	901	1166
Petawawa Nat.Forestry (6106400)	657	835	1092
Muskoka Airport (6115525)	778	1049	1486

The annual precipitation measured at Combermere can vary from year to year by about +/- 20 percent. A similar pattern is shown at Petawawa and Ottawa. A review of the precipitation records of all four weather stations clearly shows the influence of the Algonquin Dome, a hump-like physical feature on the landscape to the north and west of the watershed. Records for the Muskoka Airport station, to the west of the Algonquin Dome, show higher amounts of precipitation than the other three stations which lay to the east of the dome.

The monthly variability of precipitation at the four climate stations is shown in Table 2.02. Data on a monthly resolution at the Muskoka Airport Station is also different from values at the other three stations.

The monthly distribution of average precipitation indicates that the May to November period is usually wetter than the December to April period at Combermere, Ottawa and Petawawa, while a different pattern emerges for the Muskoka station. The difference between minimum and maximum monthly precipitation is approximately two orders of magnitude.

The two orders of magnitude difference in monthly precipitation on the watershed contributes significantly to seasonal and annual variations in levels and flow in the river.

Table 2.02: Monthly Precipitation

	Monthly Precipitation (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Combermere (6101820)												
minimum	6	8	15	22	14	22	28	15	29	18	22	22
average	56	50	53	65	76	81	75	74	86	77	73	63
maximum	121	121	128	131	161	191	193	155	175	199	132	116
Ottawa Airport (6106000)												
minimum	15	2	13	14	26	14	28	8	15	15	35	19
average	63	60	65	69	75	82	89	84	82	76	82	75
maximum	146	468	121	144	164	225	187	181	168	189	166	144
Petawawa Nat.Forestry (6106400)												
minimum	14	2	12	14	23	17	26	22	35	18	25	26
average	51	49	55	62	76	85	83	84	82	73	73	66
maximum	103	121	110	125	171	212	215	186	152	152	134	130
Muskoka Airport (6115525)												
minimum	27	12	12	19	17	29	7	11	45	35	59	44
average	92	63	67	73	89	85	84	86	107	99	109	101
maximum	213	133	144	145	172	207	200	171	235	161	197	175

2.1.2 Geology

The geology of the watershed plays an important role in the level and flows that occur throughout the watershed. The underlying geological features can constrain the path of the river and influence the response of the basin to meteorological events.

The last ice age played an important role in modifying the Madawaska Watershed. The last glaciation was at its peak about 20,000 years ago, when vast glaciers, several kilometers thick, covered and scoured the landscape. It is estimated that the Ottawa Valley has been free of ice for about 10,000 to 12,000 years, when the last of the glaciers melted and receded. During this ice retreat, enormous volumes of melt-water flowed away from the ice, draining along fault lines in the bedrock below. These fluvial forces carried materials large distances from the glacier front. As these materials were dropped along the way, they left behind a legacy of outwash deposits. Today these deposits can be seen as stratified bands of sand and gravel along steeper river valleys, and as wide outwash plains in flatter areas.

As the glaciers receded, the Madawaska River watershed was covered by a large tropical sea which blanketed a vast majority of Eastern Ontario some 12,800 years ago. This body of salty water, referred to as the Champlain Sea, was up to 190 meters deep in some areas. Numerous glacial melt-water rivers carried the finest particles of sediment, silt and clay to the Champlain Sea where they settled in layers on the lake bottom.

The Canadian Shield and the Ottawa Valley plains are the two distinct geological areas of the watershed. The spatial extent of these features are shown in Figure 2.01.

Most of the watershed area lies within the Laurentian sub-region of the Canadian Shield. The Ottawa Valley plains are limited to the eastern and downstream areas of the watershed. Canadian Shield areas are characterized by rugged bedrock outcrops, ridges and variable, stony and predominately shallow soils. Deeper deposits of sand and gravel exist in some of the small valley bottoms within the Canadian Shield. The Ottawa Valley plains area is typically flatter and contains sedimentary sandstone, limestone, shale and fine silty-clay soils.

2.1.3 Land Use

Land use can have a significant impact in levels and flows throughout the watershed. Human disturbances related to land uses can change the way the watershed responds to weather-related events such as rainfall and snowmelt.

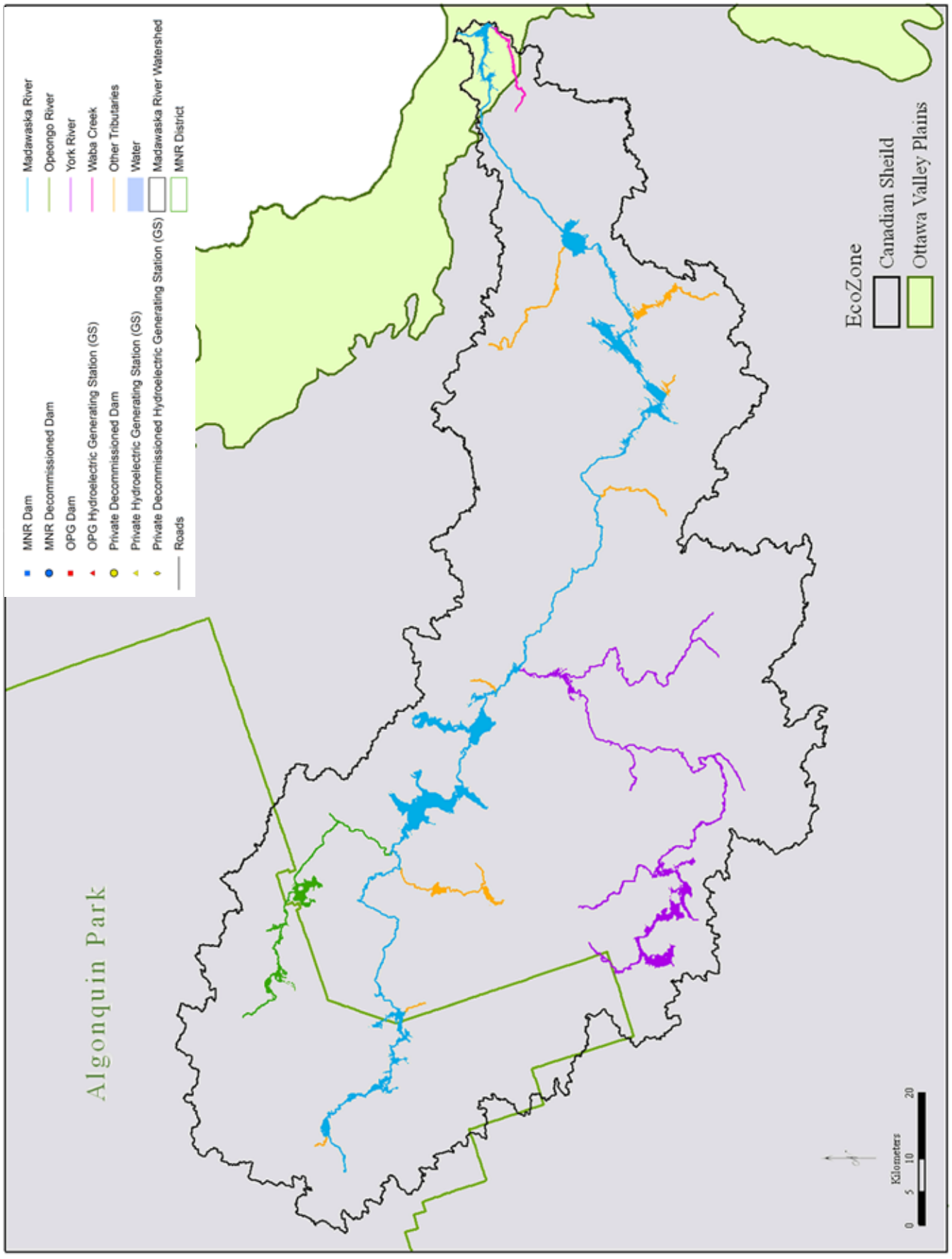


Figure 2.01: Geology of the Madawaska watershed

For example logging and agricultural activities can change the timing and amount of water that melts from the snow pack in the spring. Snow accumulated on agricultural lands or recently logged areas responds differently to weather than snow that rests underneath a forest canopy. Exposure to direct sunlight and wind can change the rate, timing and volume of water flowing into the river.

Land use within the basin is shown in Figure 2.02. Large portions of the watershed are crown lands with restricted uses such as forestry or parklands. Agricultural pasture lands and crops encompass a small portion of the watershed area within the privately held lands.

2.1.4 Basin Physiography

The Madawaska River watershed encompasses an area of approximately 8,500 km^2. For the purposes of this WMP, the Madawaska River is divided into the four main tributaries with an additional category that covers other tributaries of less individual significance:

- Madawaska River
- Opeongo River
- York River
- Waba Creek
- Other Tributaries

The channel lengths for each of the main tributaries are as follows:

- Madawaska River 270 km
- York River 120 km
- Opeongo River 52 km
- Waba Creek 19 km

The change in elevation from the headwater to the mouth of each of the tributaries are as follows:

- Madawaska River 350 m
- York River 120 m
- Opeongo River 95 m
- Waba Creek 64 m

Much of the Canadian Shield areas within the watershed are characterized by rugged hills with narrow incised valley bottoms (Figure 2.03). The valleys tend to get wider in the middle and lower portions of the watershed.

The Madawaska River falls 350 m from the outlet of Cache Lake to the confluence with the Ottawa River (Figure 2.04). The Opeongo River falls 95 m compared to the 120 m along the York River and 64 m on Waba Creek.

The OPG generating facilities on the Madawaska River are considered a cascade river system (Figure 2.05). A cascade is a series of waterfalls or it can be considered a series of steps in which the water travels over. At each of the facilities the water level upstream of the facility is fairly flat and then falls vertically at the dam into the next facility. The level downstream of each facility is essentially the same as the upstream level of the next facility in the cascade. Another way to look at this is as a set of stairs with the water flowing over each stair. Hydroelectric facilities would be located at vertical portions of each stair.

2.1.5 Vegetation

The type and extent of vegetation cover on the landscape can have a significant influence on the volume of water and sediment flowing into rivers. Figure 2.06 shows the distribution of various types of vegetation across the Madawaska watershed. Forests cover almost 85 percent of the watershed area. Open water accounts for just over ten percent of the area and agricultural pasture lands are limited to 2.5 percent.

2.1.6 Soils

Different types of soils have the ability to hold and release water at different rates. Soil type also influences the volume of sediments flowing into a river. The soils in the Laurentian sub-region of the Canadian Shield (Figure 2.01) area tend to be shallow. Soil survey data exists for most for the watershed except for the portions of the basin that lie in the County of Haliburton and Nippissing District. These two areas cover the top one third of the watershed.

2.2 CULTURAL HISTORY

The 270 km Madawaska River has a rich and colourful history. The name “Madawaska” was derived from the Algonquin name “Madoueskak”, meaning “Land of the Porcupine.” The river was a travel corridor for Aboriginal people, used for the transportation of people and goods. The Madawaska River has been an important resource for as long as people have been in this part of North America.

Following early European exploration in the seventeenth century, settlements began to spring up throughout this part of the Ottawa Valley. The first resource to be exploited was forest timber. During the last half of the 19th century, logging companies worked their way up all of the

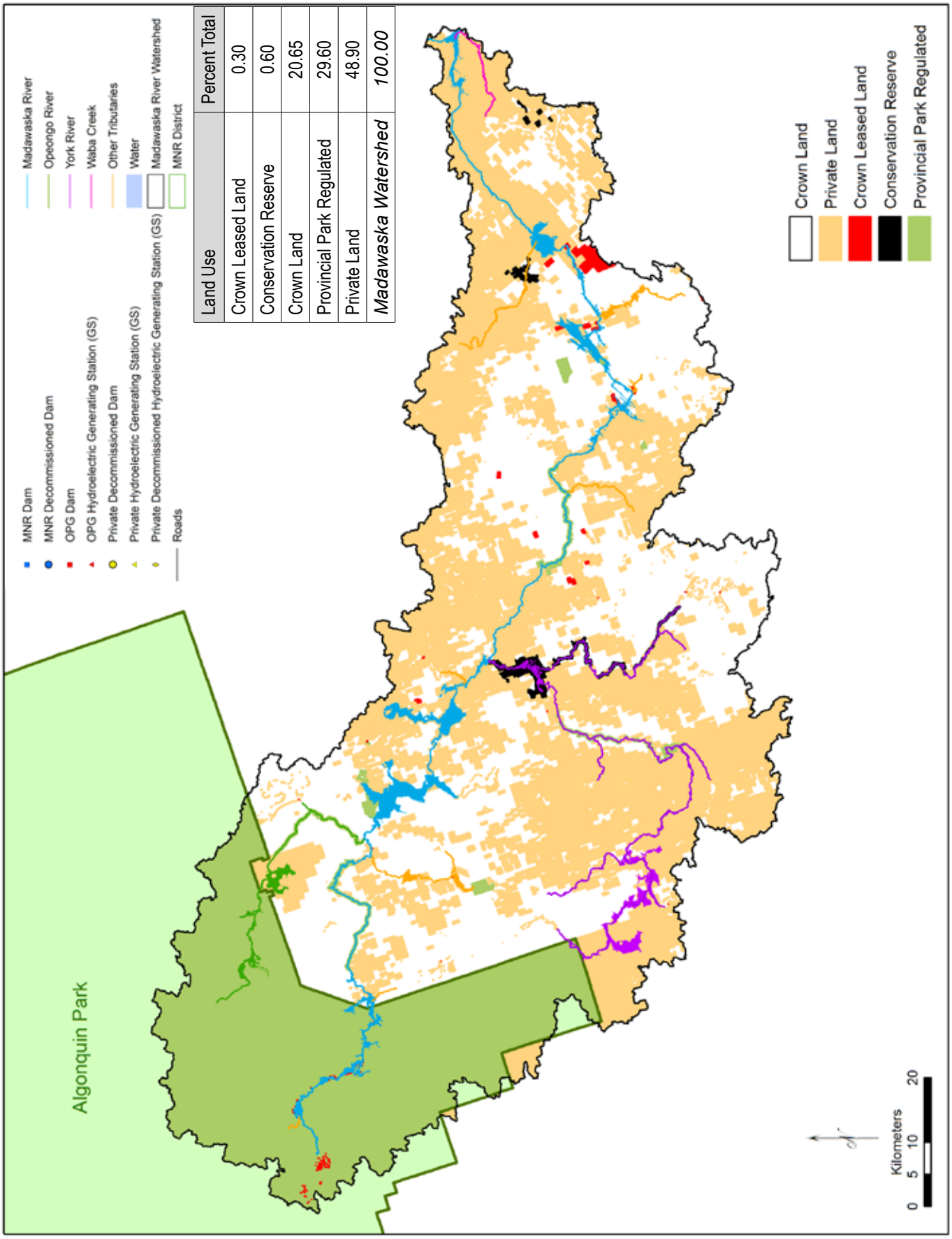


Figure 2.02: Land Use

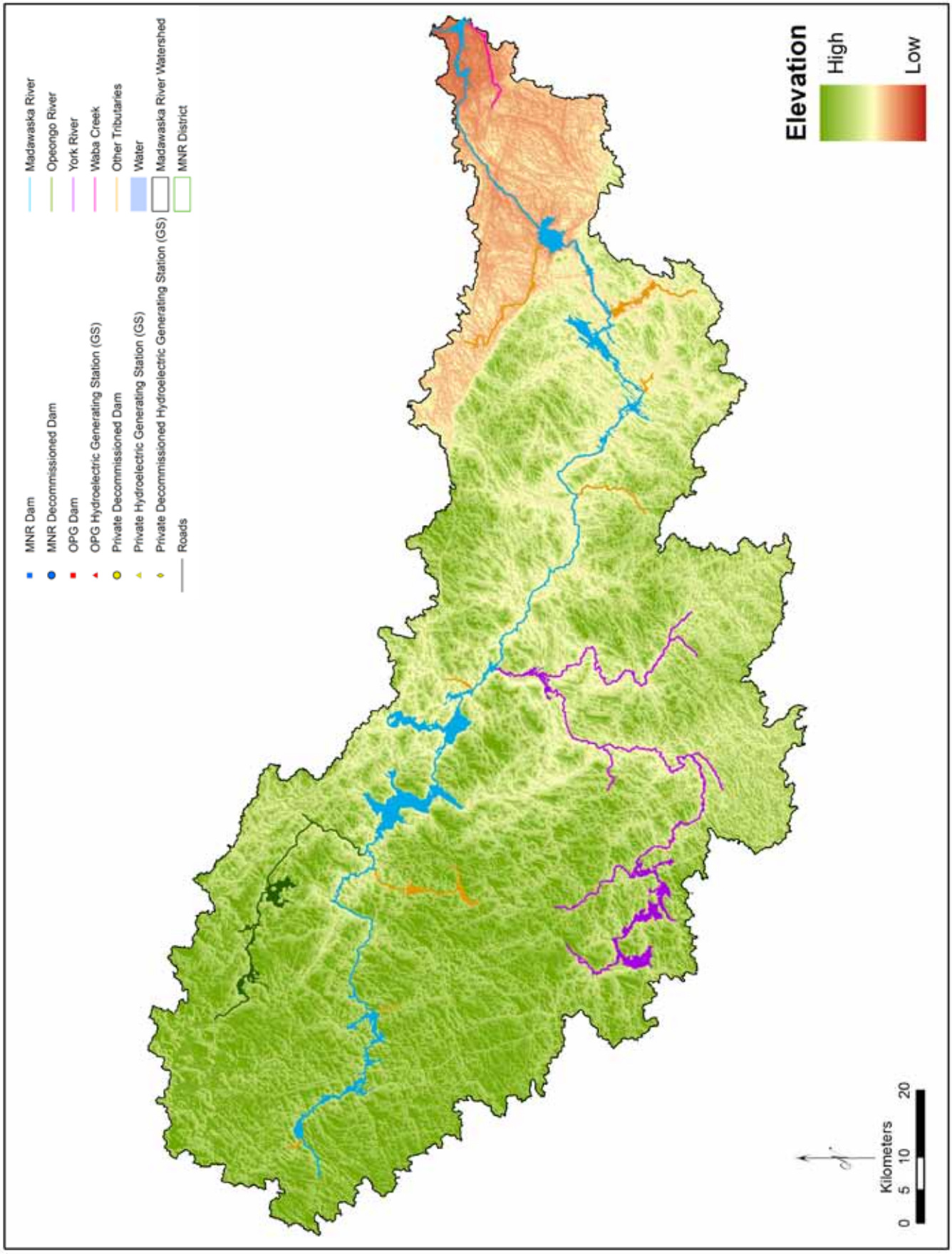


Figure 2.03: Watershed Relief

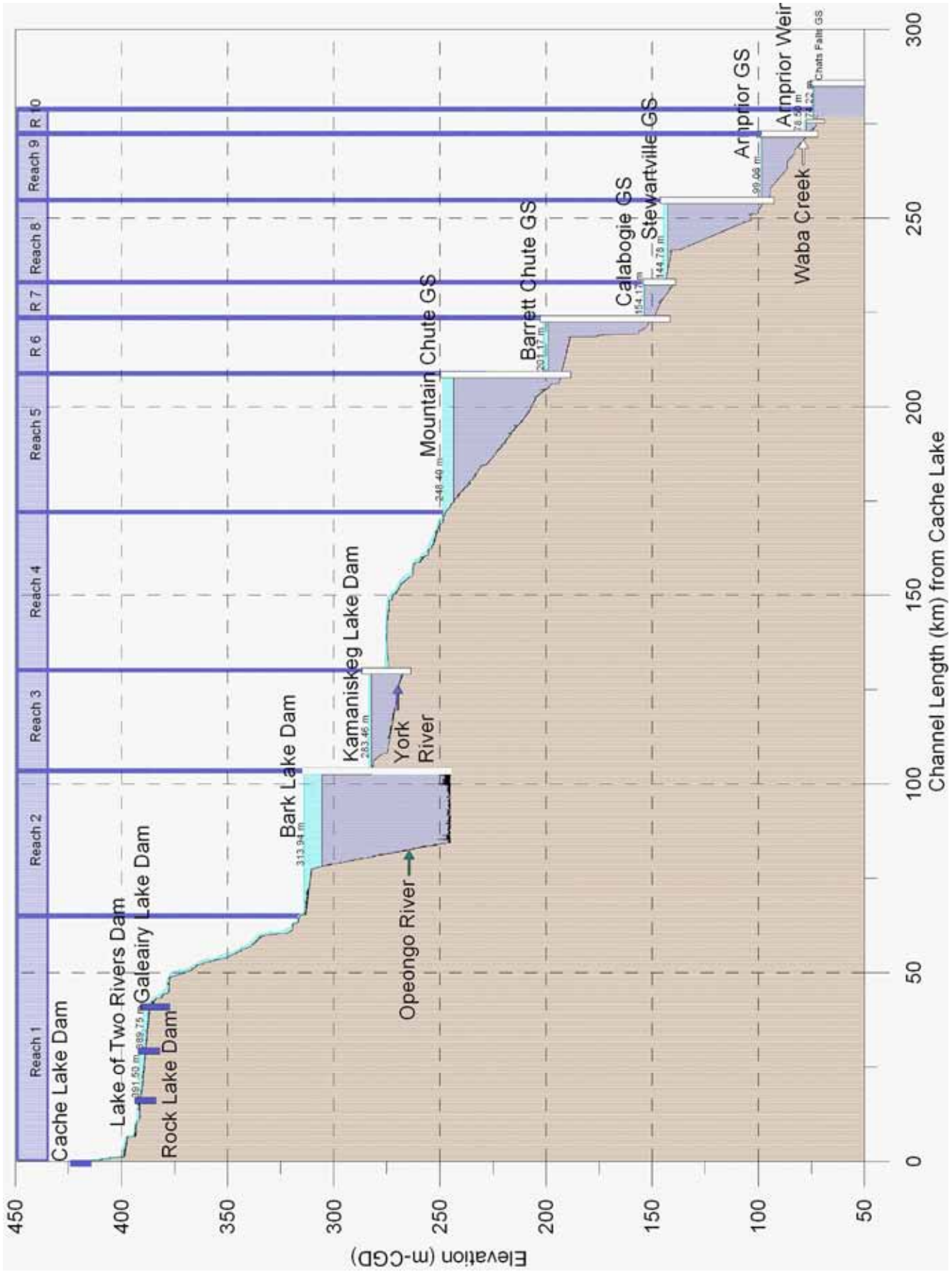


Figure 2.04: Madawaska River Profile

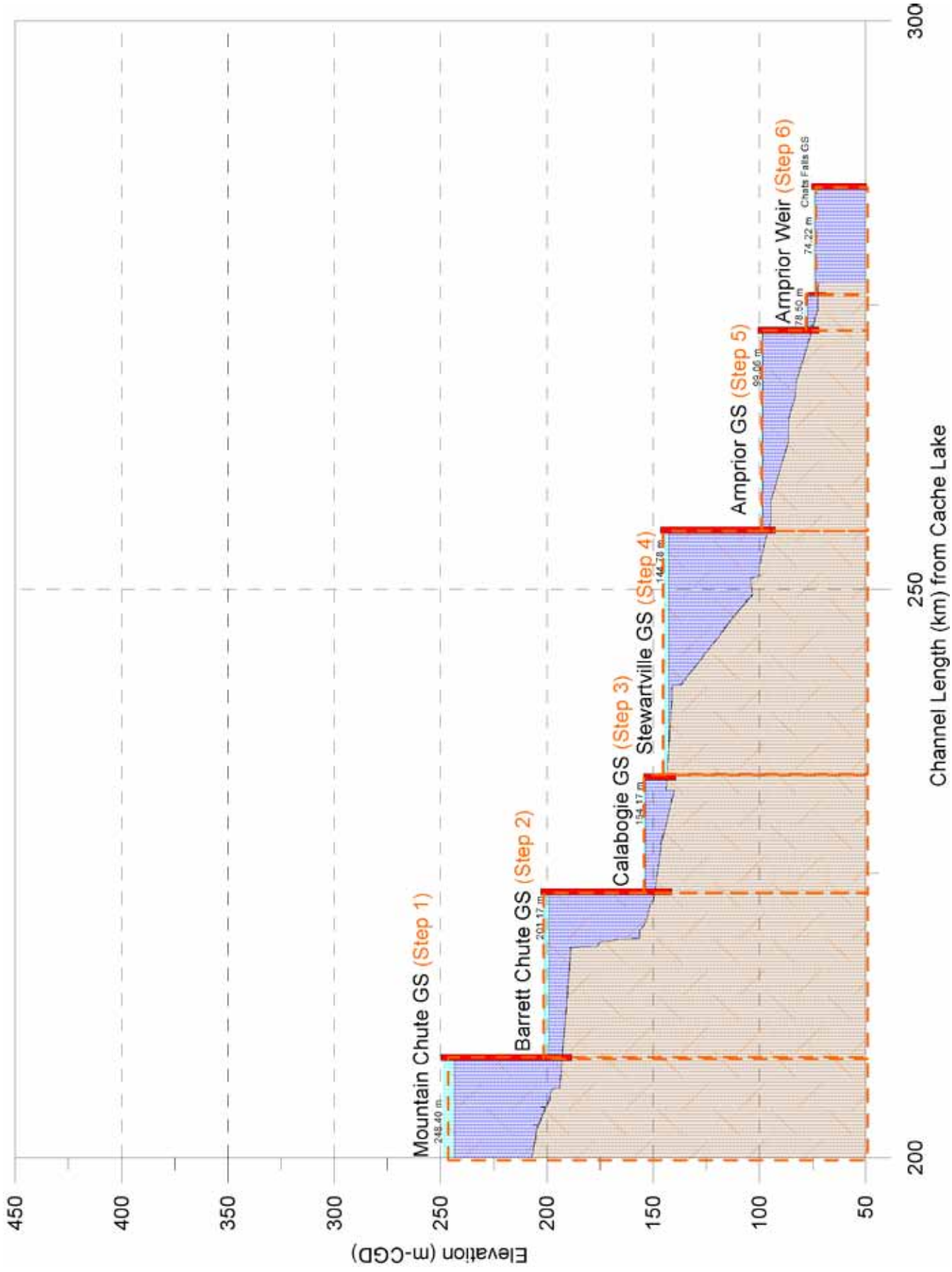


Figure 2.05: Cascade System

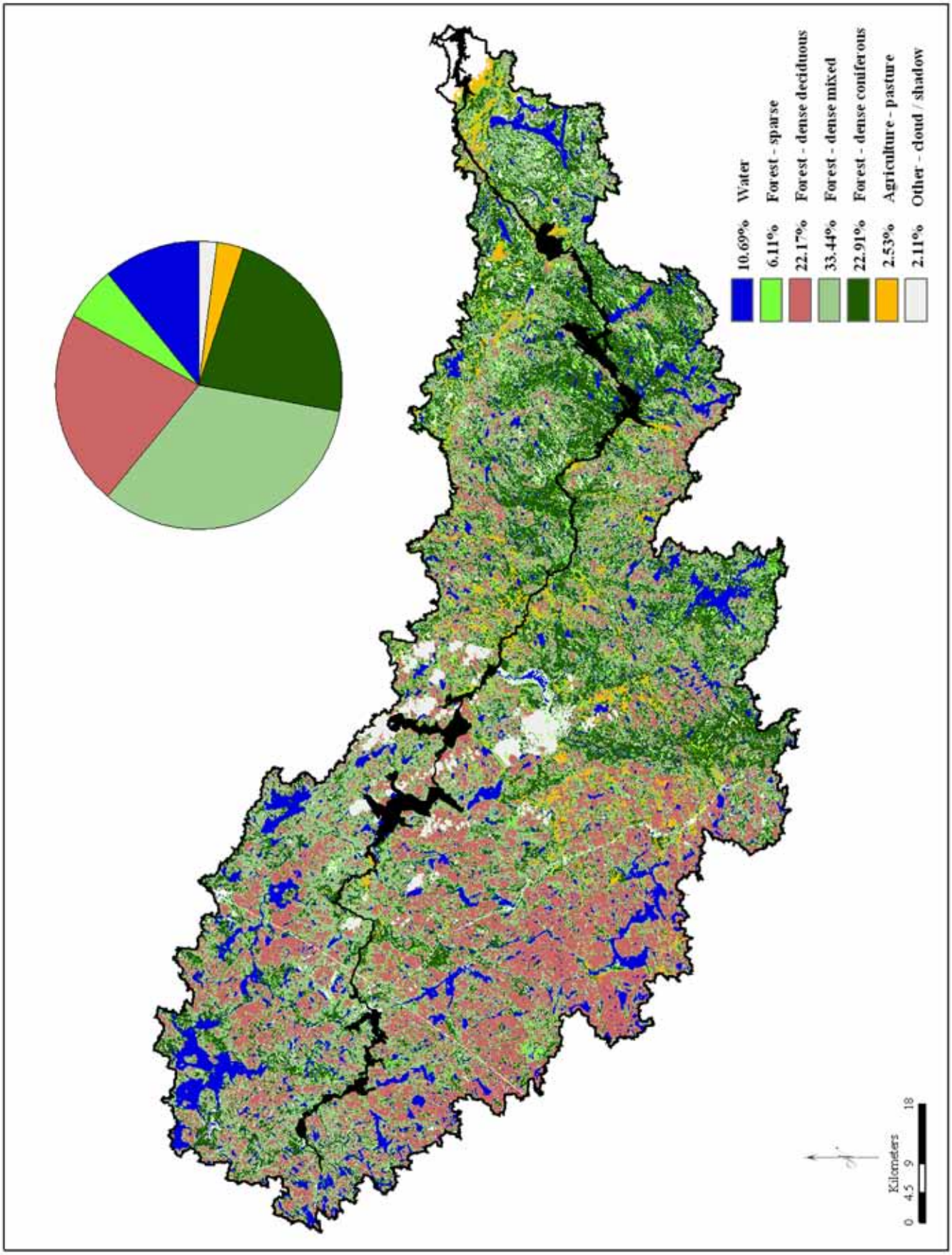


Figure 2.06: Vegetation types

tributaries of the Ottawa River, harvesting white pine, red pine and oak. Rivers provided both access to the timber and a means of getting it to market.

The Madawaska River witnessed some of the earliest commercial lumbering activities in Ontario, with the greatest activity occurring in the period from 1860 to 1890. As early as the 1840s, the government was providing assistance to lumber companies by building slides and booms to facilitate log drives on the river. By 1867, the logging companies had built dams on the upper main reservoirs including the Bark Lake and Palmer Rapids Dams. Dams were also constructed at Highland Chute, Mountain Chute, Calabogie and Arnprior to assist operations.

By the 1920s, lumbering had declined and the river use was gradually re-adjusting toward hydroelectric generation. Private interests had built a number of dams on the tributaries of the river. OPG first became involved on the river in 1929, with the purchase of Calabogie GS from the M.J. O'Brien company, along with the two upper reservoir dams at Bark Lake and Palmer Rapids.

By 1940, with the demand for energy growing as a result of World War II, Bark Lake Dam was re-constructed, raising water levels in the lake by eight metres and creating a significant storage reservoir. The lake was operated to provide flood storage and moderate flows in the river. The Barrett Chute GS was constructed and became operational in 1942. Construction of the Stewartville GS began in 1946 and was completed in 1948.

Energy demand in Ontario continued to grow through the 1960s, requiring additional resources. Mountain Chute GS was built in 1965-66. Barrett Chute GS and Stewartville GS were upgraded, increasing generating capacity by a factor of four. Arnprior GS was the last OPG dam constructed and began operating in 1976.

The construction of dams changed the free-flowing Madawaska River and its tributaries into a series of reaches. Recreation and commercial development then occurred and continues today.

In 1995, it became apparent reviewing the complex task of river management should include a formal process of public consultation. The second formal process of public consultation in the continuing evolution of the WMP occurred during the planning process for the WMP 2009.

There are 41 dams on the Madawaska River Watershed. Please refer to Section 4 for greater detail.

OPG Dams and Generating Stations:

- Bark Lake Dam
- Kamaniskeg (Palmer Rapids) Lake Dam
- Mountain Chute GS
- Barrett Chute GS
- Calabogie GS
- Stewartville GS
- Arnprior GS

OPG also owns weirs on the Madawaska River within the Town of Arnprior and on Mackie Creek.

MNR Dams

Many of the MNR dams on the watershed were originally built to accommodate log drives during the nineteenth century. These now serve only as static or operated flood and level control structures.

MNR dams on the main stem of Madawaska River:

- Cache Lake Dam
- Lake of Two Rivers Dam
- Galeairy Lake Dam
- Rock Lake Dam (not operated since 1979)

MNR dams on the Opeongo River:

- Opeongo Lake Dam
- Aylen Lake Dam
- Booth Lake (not operated since the 1970s)
- Decommissioned MNR dams (Shirley Lake, Crotch Lake and Victoria Lake)

MNR dams on the York River:

- Baptiste Lake Dam
- L'Amable Dam
- Weslemkoon Lake Dam
- Mink Lake Dam (weir, not operated)
- Salmon Trout Lake Dam
- Gin Lake Dam (not operated)
- Decommissioned MNR dam (Sandox Lak)
- Other former MNR dams (Diamond Lake flooded out)

MNR dams on Waba Creek:

- White Lake Dam

MNR dams on other tributaries:

- Sasajewun Lake Dam
- Halfway Lake Dam
- Denbigh Lake Dam
- Balaclava Dam
- Hay Lake Dam (weir, not operated)
- Lyell (Cross) Lake Dam (weir, not operated)
- Dwyers Marsh Dam (not operated)

Smaller privately owned generating stations on Waba Creek:

- Fraser Power operates Fraser GS
- Misty Rapids Power operates Stewart GS
- Barrie Small Hydro operates Barrie GS
- Private interests own the rights to power production at the Dupuis Dam

Smaller privately owned generating stations on the York River:

- Bancroft Light and Power GS is operated by the Bancroft Public Utility Corporation

2.3 HYDROLOGY

The spatial and temporal variability of the flows and levels on the main stem of the Madawaska River and on the York River are presented in this subsection. This section is further divided into four subsections. The first subsection provides information about natural flows in the river. The second provides an overview of the general operating pattern on the river. The third summarizes high and low flow requirements. The last part covers minimum flow requirements.

2.3.1 Natural Flows

Flows and levels on the Madawaska watershed have been impacted and manipulated by people since the mid 1800s. As early as the 1840s, public funding was available to lumber companies to promote and facilitate logging activities. Historic logging peaked on the Madawaska between 1860 and 1890.

The earliest written records of levels and flows start in 1915. There is no pre-development data available which provide measured values for historic natural flow patterns on the watershed.

Table 2.03 provides a list of flow gauge stations within the watershed and their period of record.

Table 2.03: Flow Gauge Stations

Station #	Start	End	Station Name
02KD001	1915	1942	MADAWASKA RIVER AT MADAWASKA
02KD002	1915	1993	YORK RIVER NEAR BANCROFT
02KD004	1930		MADAWASKA RIVER AT PALMER RAPIDS
02KD006	1942	1957	MADAWASKA RIVER AT WHITNEY
02KD007	1942	1994	MADAWASKA RIVER AT BARK LAKE DAM
02KE002	1921	1950	MADAWASKA RIVER NEAR ARNPRIOR
02KE003	1937	1953	MADAWASKA RIVER AT CALABOGIE
02KE004	1916	1917	MADAWASKA RIVER AT CLAY BANK

The gauges at the Madawaska Village, Bancroft and Arnprior provide some indication of the nature of pre-development flows. Data from 1921 to 1942 are available for all three sites. The Madawaska Village and Bancroft gauge give some indication of natural flows in the headwaters while the Arnprior gauge provides similar information for the downstream end of the river. The effect of indirect disturbances such as logging activities and direct disturbances created by the operation of the many small dams, cannot be accurately calculated and extracted from the data.

Table 2.04 shows the range of monthly average flows at Madawaska Village, Bancroft and Arnprior for the 1921 to 1941 period. Monthly average flows are used to show the monthly variability at the three locations and provides some idea of the typical annual pattern or cycle of flows.

Table 2.04: Month flows (1921 to 1941)

	Madawaska Village			Bancroft			Arnprior		
Month	min m^3/s	ave m^3/s	max m^3/s	min m^3/s	ave m^3/s	max m^3/s	min m^3/s	ave m^3/s	max m^3/s
Jan	1.5	11.0	24.2	2.3	8.9	22.1	14.9	58.3	112.0
Feb	2.1	9.4	20.1	1.8	7.1	18.1	15.0	52.3	122.0
Mar	2.2	15.2	60.0	1.7	10.1	33.0	13.5	75.3	150.9
Apr	13.1	50.1	105.3	5.8	29.0	53.3	86.4	251.9	487.9
May	22.4	49.6	81.9	5.8	26.1	49.9	96.8	242.0	377.1
Jun	9.3	20.9	34.3	0.4	11.2	21.8	49.2	119.1	207.6
Jul	5.3	12.0	22.9	0.4	7.4	21.1	31.4	61.4	116.7
Aug	3.9	8.4	20.0	1.0	6.1	17.9	19.5	39.1	100.5
Sep	2.9	6.6	17.5	1.1	6.4	12.6	17.0	30.2	60.8
Oct	2.8	8.5	41.6	2.3	7.2	16.5	19.2	37.8	123.4
Nov	2.7	12.4	44.9	2.3	9.5	26.7	22.5	55.3	183.9
Dec	1.6	13.1	34.8	2.7	9.8	20.5	20.2	62.2	159.2

The monthly average flows cover two orders of magnitude at each site just as the monthly average precipitation. The large variability of precipitation and the accumulation of snow over the winter and subsequent spring melt results in an annual flow cycle.

The minimum monthly flows at Madawaska Village occurred in the winter months. At Bancroft, flows were lowest in the month of June and July. The average monthly flows at all three sites show an annual trend with higher flows in the April, May, June period, which is the result of the spring rains and winter snow melt. Flows generally decline through the summer, rise in the fall and then decline again through the winter.

The maximum monthly flows at Madawaska Village and Bancroft indicate that fall rains can result in peak monthly flows that rise as high as a monthly average spring flow. Flow records at Arnprior indicate that maximum monthly average flows at Arnprior during the fall do not get as high as the monthly average flow during the spring.

Another way to look at the flows is to compare the amount of water per unit area. This type of analysis allows flows at the three different sites to be compared. Table 2.05 shows the average flow per unit area (L/s per km^2) of flow at the Madawaska Village, Bancroft and Arnprior for the 1921 to 1941 period.

The flow per unit area indicates some differences across the watershed. The minimum monthly values are usually less than 4 L/s per km^2 outside of the spring melt period.

Table 2.05: Flow per km^2

	Madawaska Village			Bancroft			Arnprior		
Month	min L/s	ave L/s	max L/s	min L/s	ave L/s	max L/s	min L/s	ave L/s	max L/s
Jan	1	8	18	3	11	26	2	7	14
Feb	2	7	15	2	9	22	2	6	15
Mar	2	11	44	2	12	39	2	9	18
Apr	10	37	77	7	35	64	10	30	59
May	16	36	60	7	31	60	12	29	46
Jun	7	15	25	0.4	13	26	6	14	25
Jul	4	9	17	0.5	9	25	4	7	14
Aug	3	6	15	1	7	21	2	5	12
Sep	2	5	13	1	8	15	2	4	7
Oct	2	6	30	3	9	20	2	5	15
Nov	2	9	33	3	11	32	3	7	22
Dec	1	10	25	3	12	24	2	8	19

During the spring melt period, the flow of water per unit area is at least double that of the other minimum monthly values.

The average flow per unit area at all three sites follows a similar pattern and rises to 30 to 40 L/s per km^2 during the spring. The April and May average flow per unit area at Madawaska Village is higher than at Arnprior. The average flow per unit area in April at Bancroft is similar to Madawaska Village, but reduces and is consistent with Arnprior in May. The average flow per unit area at Arnprior is lower than the other two sites in all months except June. The June average flow per unit area at Bancroft is slightly lower than at Arnprior.

The maximum flow per unit area in April is highest at Madawaska Village and lowest at Arnprior, while Bancroft lies between them. The maximum flow per unit area in May is the same at Madawaska Village and Bancroft and less at Arnprior. The maximum flow per unit area at Arnprior is equal to or less than that of the other two sites in all months.

Difference in the flow per unit area at the sites can be attributed to different amounts of precipitation and /or the differences related to the interaction of the six environmental controls. The flow per unit area highlights some differences in the flow characteristics across the watershed.

2.3.2 General Operating Pattern of Dams and Hydroelectric Facilities

An annual, weekly and or daily pattern of operation exists at many of the dams and hydroelectric facilities within the watershed. The general operating pattern can change the levels and flows within the river. Section 4 provides a brief overview of all the dams and hydroelectric facilities within the watershed.

The hydrology of the watershed is driven by complex interactions of climate, geology, land use, physiography, vegetation and soils, combined with direct human intervention at dams and hydroelectric facilities. Many of the dams and hydro facilities were designed to increase water levels at a specific location for a specific purpose. For example, the hydrolectric facilities on Waba Creek and York River have minor or insignificant storage potential. These structures were designed to create a consistent water level and deliver water to turbines for power production. These facilities do not have the capability of capturing and storing large amounts of water, for example from spring

freshet, for release throughout the year. Other dams and facilities such as Bark Lake were designed to capture and store large amounts of water for later use.

A number of the dams as well as Mountain Chute GS are operated on an annual cycle. The operation is carried out to follow the usual annual cycle of flows. Flows in the river are usually higher in the spring and then decline through the summer. Flows usually rise in the fall and decline through the winter. The strategy behind the annual cycle of the reservoirs is to have lots of storage room or an empty reservoir before flows rise in the spring. The use of the reservoir storage in the spring usually reduces flooding downstream from the reservoir. The storage at some sites is slowly reduced as flows decline later in the spring, or can be maintained near full through the summer months. In the fall some reservoirs release a small amount and may refill during a wet fall. The reservoirs are then emptied through the winter and the cycle repeats.

The annual operating pattern moves water from the spring into the winter and / or summer. The flows are reduced in the spring at many locations and higher flows are observed during the winter and late fall. Other OPG Hydroelectric Facilities generate power on a daily cycle producing a daily flow cycle. The daily cycle involves storing water through the evening and early morning and releasing water through the day. This daily cycle moves water from periods of low energy demand to periods of higher demand through the day. The daily cycle disappears when flows are high. In low periods, the stations may only run for one hour per day.

The flood control function of OPG's facilities is a significant benefit for people and communities in the Madawaska River valley. Flood management is an operational priority at these facilities. The protection of human life comes before all other water management considerations on the river.

Bark Lake is the largest flood storage reservoir on the Madawaska River. The lake has a winter drawdown of approximately 9 m providing 339 million m^3 of storage. Mountain Chute GS forebay (Centennial Lake) has a winter drawdown of approximately 4.0 m and provides 104 million m^3 of storage. The reservoirs are used to store water during the spring and reduce peak flows in the river. The other OPG facilities have some storage but are insignificant for flood control use.

Bark Lake is normally emptied by the end of February. Once the Bark Lake drawdown is complete, Mountain Chute GS is emptied during March. The watershed is monitored continuously for incoming flows in order to assess conditions and manage the water to reduce flooding.

Bark Lake and Kamaniskeg Lake have similar drainage areas, provide similar volumes of water during spring freshet and reach peak flows at approximately the same time. Kamaniskeg Lake has very little storage available and a smaller amount of storage exists on the York River at a few MNR dams. This means the water reaching Kamaniskeg Lake must be passed downstream.

The water management strategy is to fill Bark Lake while the local inflow to Kamaniskeg Lake rises, peaks and then begins to recede. By storing water in Bark Lake until the inflows to Kamaniskeg Lake have peaked and receded, potential flooding on Kamaniskeg Lake and downstream of Palmer Rapids is reduced. If the storage at Bark Lake was not used during the spring, the inflow into Bark Lake would be added to the Kamaniskeg Lake. This would substantially increase the amount of water needed to be passed at Palmer Rapids and therefore more flooding potential on the lake and downstream.

Once the flow during the spring has peaked, Bark Lake flow is managed to balance the requirement to fill the lake to the summer operating range and cover spawning beds during the incubation period at Bells Rapids. Spawning bed coverage has priority.

Monthly flows at Arnprior, Adjusted Arnprior and the York River at Bancroft from 1977 to 1993 are summarized in Table 2.06. The Adjusted Arnprior column is calculated by adjusting the monthly flow numbers by the storage change at Mountain Chute GS and Bark Lake.

General observations can be made between the data from the 1921 to 1941 period (Table 2.05) versus the 1977 to 1993 (Table 2.06). However, the change between the two time periods may be attributed to a combination of any of the six external environmental controls as well as operational changes at any of the dams or hydroelectric facilities.

A summary of changes between time periods at Bancroft are:

- The 1977 to 1993 period minimum monthly flows are higher in every month except October.
- The 1977 to 1993 period average is higher from November to April and lower from May through October.
- The 1977 to 1993 period maximum values are higher September through January and lower May through August.

The change between the two periods may be attributed to a combination of any of the six external environmental controls as well as changes in operation at the Bancroft Dam as well as other dams at Mink Lake, Diamond Lake and Sandox Lake. The changes between the periods seem to be systematic and reflect some seasonal trends.

The Arnprior Gauge from the 1921 to 1950 period was measured upstream of the current location of the Arnprior GS. The watershed area of Arnprior GS is approximately 250 km^2 or a reduction of area of about three percent. The Madawaska River near Arnprior Gauge (02KE002) excludes the Waba Creek area.

A summary of changes between time periods at Arnprior (including the use of storage at Bark Lake and Mountain Chute) are:

- The 1977 to 1993 period minimum monthly flows are higher from November to April and lower from May through September.
- The 1977 to 1993 period average is higher from October to March and lower from April through August.
- The 1977 to 1993 period maximum values are higher November through March and lower April through August.

The Adjusted Arnprior flow information removes the influence of the use of storage at Bark Lake and Mountain Chute. A summary of changes between time periods for the Adjusted Arnprior flow are:

- The 1977 to 1993 period minimum monthly flows are higher from November to April and lower from May through September. This is not different than general observations with the use of storage.
- The 1977 to 1993 period average is higher from October to April and lower from May through August. This is slightly different than general observations with the use of storage.
- The 1977 to 1993 period maximum values are higher November through March and lower April through August. This is not different than general observations with the use of storage.

A summary of the changes due to the use of storage at Bark Lake and Mountain Chute are:

- The use of storage increases the minimum monthly flows from December to February and decreases the minimum monthly flows from March to May.
- The use of storage increases the average monthly flows from December to February and decreases the minimum monthly flows from March to May.
- The use of storage has a minor impact on the maximum monthly flows from May to December, increases the maximum monthly flow in January and decreases the maximum monthly flow in March and April.

Table 2.06: Monthly flows (1977 to 1993)

Month	Bancroft			Arnprior			Adjusted Arnprior		
	min m^3/s	avg m^3/s	max m^3/s	min m^3/s	avg m^3/s	max m^3/s	min m^3/s	avg m^3/s	max m^3/s
Jan	5.4	9.9	20.63	77.1	121.9	178.0	35.0	69.3	132.6
Feb	5.2	9.1	22.2	77.9	119.5	189.8	33.8	81.7	191.3
Mar	9.0	16.3	30.1	86.9	143.8	304.3	109.8	173.9	328.7
Apr	26.4	39.1	53.9	112.1	218.8	357.6	158.3	279.0	429.0
May	10.0	21.4	46.7	45.6	151.8	363.1	53.0	175.1	367.3
Jun	4.3	9.9	19.2	26.8	75.5	138.8	26.1	75.8	141.9
Jul	1.3	5.1	12.2	11.8	34.4	78.3	7.2	32.0	81.4
Aug	0.9	4.4	13.7	13.1	26.8	76.3	9.9	24.4	68.1
Sep	1.3	4.6	14.4	10.9	32.6	145.9	6.9	31.2	141.7
Oct	1.1	6.2	20.4	17.8	49.8	115.0	16.5	50.4	107.9
Nov	3.6	10.4	31.9	34.4	80.1	221.7	39.7	78.9	213.6
Dec	6.4	13.7	25.9	62.0	107.6	180.5	43.5	91.8	175.2

Appendix H contains graphs displaying the flow and level history for the following sites:

- Bark Lake
- Kamaniskeg Lake - Barry's Bay
- Mountain Chute GS
- Barrett Chute GS
- Calabogie GS
- Stewartville GS
- Arnprior GS

2.3.3 Above Normal & Low Water Conditions

The operating regime provisions of this WMP may not apply during:

- Declared floods – When a flood emergency is declared by a local municipality. Impacts from these flooding events are managed through local emergency response plans. Operators will co-operate with local emergency response teams to address flooding issues.
- Low-water emergencies – When a Level-2 low-water response is in effect. Operators will co-operate with low-water response teams to address the low-water conditions. Minimum flows (Section 2.3.4) still apply during low-water emergencies.
- In high-water conditions not involving a declared flood, seasonal flood control associated with spring freshet and periods of heavy rainfall, is an important secondary function of waterpower operations on the river.

2.3.4 Minimum Flows

Historically, some levels of minimum flow have been maintained in the Madawaska River and its tributaries, based on leakage through, and the normal operation of, control structures. Specific minimum flows for each dam or facility are specified in Section 9.

The five OPG generating facilities on the Madawaska River and the Arnprior weir are considered a cascade system. A constant minimum flow is not required at these facilities because the level at each facility ensures that the river reach between them is not dewatered.

Facilities with an established minimum flow must maintain that flow as specified in Section 9. Provisions to pass a minimum flow through each structure, by manipulations of the logs, gates, valves, powerhouse operation, or leakage will be required at other dams or facilities as they are rebuilt or replaced. The intent is to ensure that a continuous, uninterrupted minimum flow is maintained in the Madawaska River and its tributaries for the protection of fish habitat. This overall requirement to maintain minimum flows is not intended to address any specific local habitat issues, if and where they may exist, but is intended only to address the continuation of a level of minimum flow in the river at all times.

2.4 AQUATIC ECOSYSTEMS

Ecosystem effects are divided into hydroelectric development effects, those resulting from initial construction of the facilities and creation of the reservoirs, and operational effects, those resulting from water management and resulting variation in flows and water levels. Although the water management plan deals strictly with water management, an understanding of past development effects may help to understand the current state of fish communities and aquatic ecology.

2.4.1 Development Effects

Ten reaches of the Madawaska River system have been altered by hydroelectric development. Each of these areas is unique in terms of how the pre-developed area was affected by the introduction of hydroelectric dams. Natural riverine and wetland areas were flooded to create reservoirs, terrestrial lands were converted to aquatic ecosystems, and water was diverted from waterfalls and rapids to power canals leading to the generating stations.

The development of the Madawaska River began with the logging industry in the 1800s followed by the construction of hydroelectric facilities. These activities have altered natural ecosystems and left us with the different but functioning ecosystems we have today. Very little biological information was collected prior to altering the natural, pre-development ecological state of the river. Most of the ecological information available today has been collected over the last 40 years.

The creation of new reservoirs (i.e. Lake Madawaska, Norcan Lake, Centennial/Black Donald Lake and Negeek Lake) converted riverine habitat to lacustrine (lake-like) habitat. Flooding of terrestrial soils and vegetation probably led to the release of nutrients and an initial increase in fish productivity (trophic surge) and yield for a few years after flooding, followed by a slow decline to current levels. The creation of these reservoirs flooded many natural habitats

such as wetlands, seasonal swamps, rapids and riffles, small lakes and terrestrial upland habitats that existed along the Madawaska River. Some wetlands (Springtown wetland, Griffith's marshes) were created by flooding for dam headponds. The created reservoirs provide habitat for a wide diversity of fish species and the angling opportunities in these lakes are plentiful; however, it is unknown what impact the creation of these reservoirs had on the natural fish and wildlife populations that lived in the Madawaska River prior to development.

The construction of dams and generating stations at the inlets and outlets of lakes that existed prior to OPG developments (i.e. Calabogie Lake, Black Donald Lake, Kamaniskeg Lake and Bark Lake) have had known impacts on aquatic ecosystems. The construction of hydroelectric dams has caused the loss of historic fish spawning habitat, extirpation of fish species and changes in the natural water levels on these lakes. Altered and destroyed spawning habitat below some dams has been mitigated by creating walleye spawning shoals. There are habitat losses that cannot be restored, such as historical pike spawning areas, lake trout and walleye spawning shoals. With loss of habitats and dams blocking passage of fish, extirpations of fish species have been documented (e.g. native lake trout, American eel and lake sturgeon).

Hydroelectric development has raised the water levels in all of the reaches. Higher water levels have increased lake areas and created new fish habitat. Wetlands have also been created or enhanced due to the dams impounding these lakes. The Springtown Marsh was likely smaller before the construction of Stewartville GS.

Hydroelectric development diverted water from natural river channels (e.g. Barrett Chute GS -High Falls and Calabogie GS -North Channel) displacing river spawning fish species, including walleye, from their original spawning habitat. At the four largest generating stations, existing spawning habitat may also have been destroyed during channelization of the river immediately downstream of the facility. In recent years, this latter effect has been partially mitigated by the construction of artificial spawning shoals at three stations.

2.4.2 Operational Effects

Operating the dams along the Madawaska River affects aquatic ecosystems. The dams have altered the natural flow of the water that passes through the river each year. A natural river would have large uncontrolled volumes of water in the spring, low water levels in summer and water level fluctuations during severe dry or wet weather events. Reservoir operation reduces flooding and stabilizes water levels in some reaches but also creates unnatural seasonal, daily and hourly fluctuations in other reaches. All of these activities have effects on the fish and wildlife communities living in and along the Madawaska River.

The majority of concerns downstream of Mountain Chute GS related to peaking operations. Peaking operation occurs at four generating stations (Mountain Chute, Barrett Chute, Stewartville, and Arnprior). Flows are being discharged through the stations during the day when electricity is in demand. This causes problems for species like walleye and suckers, which prefer to spawn in strong flows during the spring. Most fish species will spawn during the day when the stations are operating. However walleye prefer to spawn after dark during the off-peak phase of hydroelectric production. During the spawning period, OPG presently runs water though one turbine during a portion of the night to provide flows to stimulate walleye spawning at Mountain Chute, Barrett Chute and Stewartville stations. Although no requirement exists at Arnprior, the majority of the flow that is passed through Stewartville must also be passed through Arnprior.

Upstream of Mountain Chute where water flows do not undergo hourly changes for hydroelectric production, flow management guidelines to enhance walleye spawning are in place or are being assessed. Some sections of the upper river are affected by flows from tributaries, which are not controlled by OPG. MNR and OPG are coordinating efforts to provide enhanced spawning conditions where flows can be managed to improve fish spawning.

Water flows and levels are also managed on a seasonal basis. After the spring spawning period (late April to early May), declining seasonal flows throughout the system coupled with reservoir filling in the upper system and peaking in the lower system, may result in exposure and drying of incubating fish eggs. OPG reduces this risk below some of the dams by forcing fish to spawn at lower elevations in the spring (when incoming flows will permit) and by maintaining higher water levels from downstream dams. Flow and level constraints for the walleye spawning and incubation have been developed. WMP requirements will be monitored and an adaptive management approach will be used to improve spawning scenarios for each area.

In the summer, storage capacity in the reservoirs (Bark Lake, Kamaniskeg Lake, Negeek Lake, Centennial Lake, Norcan Lake) is not normally used for hydroelectric production or flood control. There is no drawdown at this time of year except during energy/capacity emergencies. Peaking operation at the stations does cause frequent

changes in flow. The effects of water level fluctuations on summer spawning fish such as smallmouth bass are believed to be small. Small fish species (e.g. minnows) and juvenile fish may be stranded along the shore during off-peak operations.

The effects of recurring rapid changes, current velocities and volumes on riverine ecosystems remain largely unstudied.

Extensive winter drawdown in reservoirs (Black Donald/Centennial Lake, Bark Lake) affects the ecology of the reservoir littoral zones and shoreline wetlands and may reduce overall productivity of the fish and wildlife communities in these water bodies. Drying and freezing of the wetlands in the winter will have other ecological effects on plants, amphibians, reptiles, invertebrates and furbearers. The rate of filling of reservoirs in the spring is controlled by the competing demands of flood control and recreation use rather than hydroelectric production. However, fish species like northern pike that spawn in the early spring may not have access to potential wetland and littoral zone habitat. Lake trout have their spawning shoals exposed in reservoirs where winter drawdown is extensive. The winter drawdown is required to manage spring water flows in the Madawaska River and is an important component for flood control. Some fish and wildlife communities will be affected by this form of water management. It may be more difficult to mitigate these effects but options can be considered.

Maintaining water levels in a narrow operating band over the summer and winter in lakes and reservoirs for recreational purposes may negatively affect the health of wetlands. Conroy's Marsh is the best example. Maintaining a very stable water level on a riverine system is a very unnatural phenomenon. Marshy wetland and shoreline areas become stagnant. Stagnation of these habitats causes soils to become water-saturated and nutrient-poor, and causes reductions of emergent aquatic plants and the creation of large areas of shallow open water. Fish and wildlife communities dependent on marshy habitats for portions of their life cycle are negatively impacted. Issue 5.2.3.6 provides more information on this issue.

2.5 ECOLOGICAL SITE REGION & SITE DISTRICT

Ecological Site Regions and Site Districts for Ontario have been developed by MNR to provide an ecological context to aid in broad-scale and landscape approaches to resource management and other planning activities. Site Regions share similar broad climatic patterns (e.g. temperature and precipitation) while Site Districts within these Site Regions are areas where vegetation communities respond similarly to landscape features (e.g. depth of soil, soil type) (see Figure 2.07).

The Madawaska River watershed is in Site Region (5E) and Site Region (6E). Predominantly, the difference between the two site regions is that 5E Site Region falls within the Canadian Shield while, 6E is characterized as mixed-wood plains. The Madawaska River watershed falls within Site Districts 5E-10, 5E-9, 6E-16 and 5E-11 (Crins, 2002).

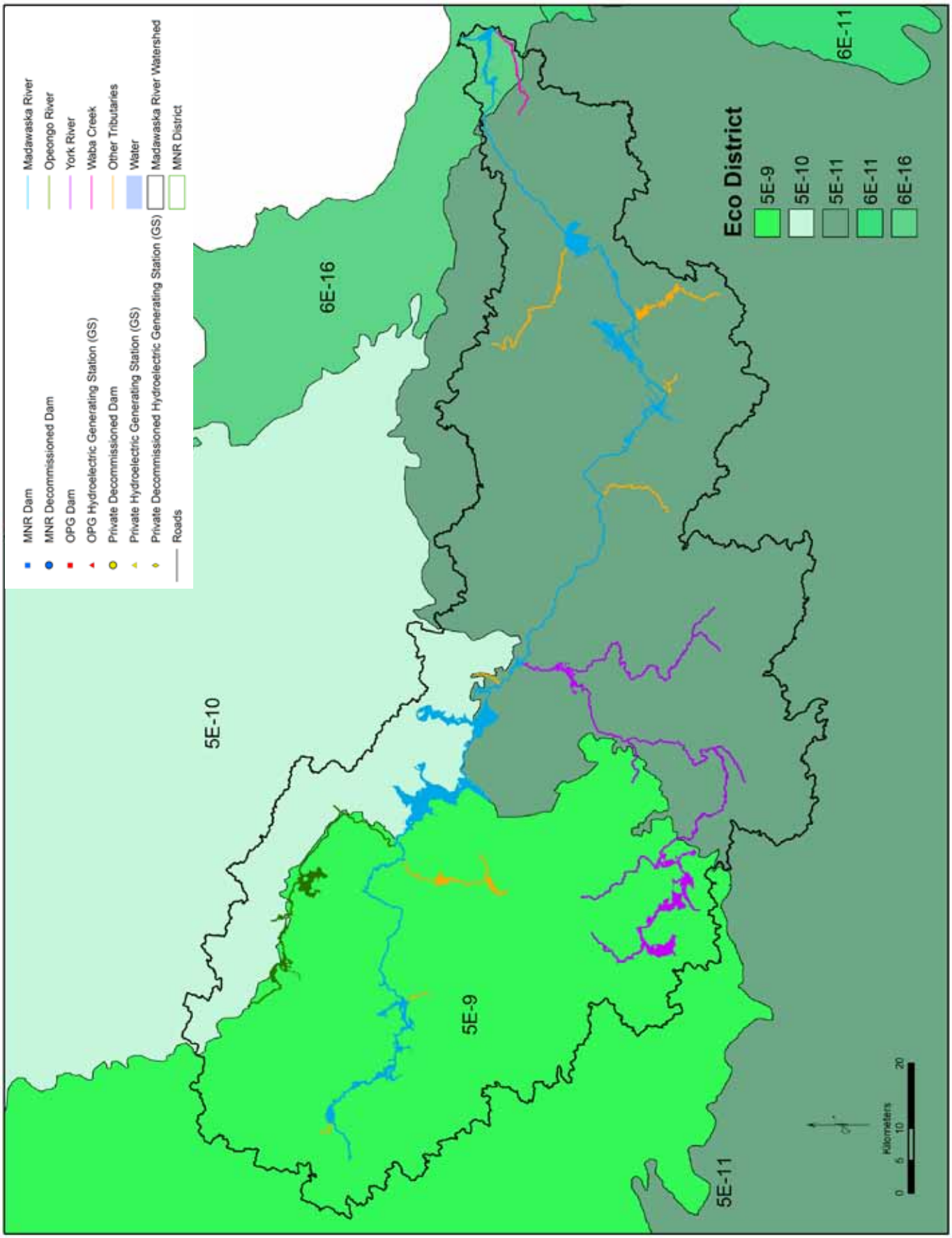


Figure 2.07: Ecological Site Regions

3 SOCIO-ECONOMIC DESCRIPTION AND PROFILE

The purpose of this section is to put the operation of the water control facilities on the Madawaska River into context with the other uses of the river. This section is divided into two sub-sections:

- Dams and Hydroelectric Facilities
- Other Commercial and Recreational Uses

3.1 DAMS AND HYDROELECTRIC FACILITIES

The dams and hydroelectric facilities within the watershed are listed in Table 3.01. Of the dams listed, the majority are operated; however, some of them have been decommissioned while others act as a weir. Chapter 4 contains a brief overview of each dam and hydroelectric GS.

There are 41 structures on the watershed. MNR owns 25 dams. OPG owns five generating stations, two dams and one weir on the main stem of the river. There are four additional generating stations owned by other companies or private interests.

All nine hydroelectric facilities within the watershed are listed in Table 3.02. The owner, tributary, electrical capacity, head and turbine discharge are also listed in Table 3.02.

OPG is the only owner of multiple hydroelectric facilities on the watershed. All OPG facilities have capacities greater then 1 MW. All non-OPG generating stations have capacities of less than 1 MW.

OPG generating stations on the Madawaska River are part of the interconnected electric grid managed by the IESO. Energy produced by OPG is sold to the wholesale market managed by the IESO and provides power to customers in the Province of Ontario. Approximately 31,600 MW of installed generation exists within the Ontario electrical market. Installed generation capacity consists of 36.1 percent nuclear, 24.5 percent hydroelectric, 20.3 percent coal, 10.7 percent gas, 1.5 percent wind and 6.9 percent other sources such as wood and waste fuel.

The amount of energy produced by OPG facilities on the Madawaska River is one terawatt hour (TWh) which is three percent of the overall hydroelectric contribution of OPG and less than one percent of the energy consumed through the Ontario electrical market. The combined

Table 3.01: Dams on the Madawaska River

Site	York Tributary	Owner	Drainage Area (km²)	Channel Length (km)
Cache Lake Dam	Madawaska	MNR	74	
Lake of Two Rivers Dam	Madawaska	MNR	261	15.3
Rock Lake Dam	Madawaska	MNR	731	14.1
Galeairy Lake Dam	Madawaska	MNR	1038	11.6
Bark Lake Dam	Madawaska	OPG	2692	61.5
Palmer Rapids Dam (Kamaniskeg Lake)	Madawaska	OPG	5783	28.1
Mountain Chute GS	Madawaska	OPG	7309	78.2
Barrett Chute GS	Madawaska	OPG	7541	14.6
Calabogie GS	Madawaska	OPG	7647	10.1
Stewartville GS	Madawaska	OPG	8165	21.7
Arnprior GS	Madawaska	OPG	8498	17.6
Arnprior Weir	Madawaska	OPG	8507	3.2
Opeongo Lake Dam	Opeongo	MNR	346	
Booth Lake Dam	Opeongo	MNR	458	14.0
Shirley Lake Dam	Opeongo	MNR	84	
Crotch Lake Dam	Opeongo	MNR	566	7.5
Victoria Lake Dam	Opeongo	Private	632	8.0
Aylen Lake Dam	Opeongo	MNR	175	

Table 3.01: Dams on the Madawaska River Continued

Site	York Tributary	Owner	Drainage Area (km²)	Channel Length (km)
Sandox Lake Dam	York	MNR	4	
Mink Lake Dam	York	MNR	73	
Diamond Lake Dam	York	MNR	30	
Baptiste Lake Dam	York	MNR	707	41.2
Bancroft Light & Power GS	York	Bancroft PUC	843	16.4
L'Amable Lake	York	MNR	39	
Salmon Trout Lake Dam	York	MNR	8	
Gin Lake Dam	York	MNR	26	
Weslemkoon Lake Dam	York	MNR	291	
White Lake Dam	Waba	MNR	197	
Fraser GS	Waba	Fraser Power	197	0.4
Stewart Mill	Waba	Private	205	3.9
Stewart GS	Waba	Misty Rapids Power	205	1.3
Barrie GS	Waba	Barrie Small Hydro	206	1.0
Dupuis Dam	Waba	Private	241	14.8
Sasajewun Lake Dam	Other	MNR	86	
Hay Lake Dam	Other	MNR	149	
Lyell (Cross) Lake Dam	Other	MNR	14	
Halfway Lake Dam	Other	MNR	170	
Denbigh Lake Dam	Other	MNR	22	
Dwyers Marsh Dam	Other	MNR	21	
Balaclava Dam	Other	MNR	173	
Mackie Creek Dam	Other	OPG	163	

Table 3.02: Hydroelectric Facilities

GS Name	Owner	Tributary	Capacity	Head	Turbine Capacity
Mountain Chute GS	OPG	Madawaska	170 MW	47.0 m	435 m³/s
Barrett Chute GS	OPG	Madawaska	176 MW	46.9 m	458 m³/s
Calabogie GS	OPG	Madawaska	4 MW	8.2 m	65.6 m³/s
Stewartville GS	OPG	Madawaska	182 MW	45.5 m	457 m³/s
Arnprior Gs	OPG	Madawaska	82 MW	21.2 m	480 m³/s
Bancroft Light & Power GS	Bancroft L&P	York	600 kW	8.0 m	12 m³/s
Fraser GS	Fraser Power	Waba	45 kW	4.0 m	2.3 m³/s
Stewart GS	Misty Rapids Power	Waba	204 kW	14.4 m	1.9 m³/s
Barrie GS	Barrie Small Hydro	Waba	100 kW	6.4 m	2.28 m³/s

capacity of the Madawaska River plants is approximately 611 MW. However, in terms of capacity, the Madawaska represents approximately nine percent of OPG's hydroelectric resources or two percent of the installed generation capacity within the Ontario electrical market.

The value of energy is a function of many variables and can vary from hour to hour and year to year. The average wholesale electrical price in Ontario electrical market from 2003 to 2007 was $56.24 per MWh. Revenue associated with the energy production on the Madawaska River is worth about $60 million annually based on the average wholesale price. The Madawaska River is an important source of hydroelectric capacity and energy. The stations are operated as peaking plants. They operate less than 24 hours per day except during high flows. When the stations are not being run, no water is discharged. The stations usually operate six hours or less per day during the summer. A peaking station requires storage for the water during the non-operating period of the day.

Electricity demand varies over the day. Demand is highest during morning through early evening and the least during the late evening and early morning. Electricity demand depends on industrial/commercial processes, heating/air conditioning needs and weather factors (wind, illumination, temperature, humidity). The change in the demand over the course of the day is different on weekdays and weekends. Demand also varies over the year. Spring and fall are the lightest load periods because heating and air conditioning needs are less. Historically in Ontario, winter is the highest demand period. However, the peak demand set in the summer of 2006 is higher than the peak demand during the winter. The winter peak for electricity demand set in 2004 was 24,979 MW. The summer peak for electricity demand set in 2006 was 27,005 MW.

Hydroelectric units are used to match generation to constantly changing electricity demand on the power system during the day. Hydroelectric units are important because they start quickly and provide immediate power and energy. Fossil units require many hours to warm up and then take more time to reach full power. Nuclear units are designed to operate in either an on or off mode. They provide constant power and do not peak. This type of power is called "base load." If the electricity demand were constant, there would be no requirement for peaking hydroelectric plants.

A peaking hydroelectric system must have a reasonable amount of storage for water to be able to have the flexibility to produce energy when the demand is the greatest through the day. Peaking facilities can also move energy from one day to the next, or the following week if larger water storage capabilities exist. This allows OPG to move production into periods of higher demand during the day or future days.

Madawaska River hydroelectric plants offer significant operating reserve to the electrical system. Operating reserve is a requirement for stable and reliable electrical systems. Operating reserve exists to ensure there is always enough supply to meet the demand for electricity. Operating reserve is stand-by capacity that is used when the power system experiences a severe strain. The IESO typically requires between 1,350 and 1580 MW of operating reserve at any given time.

Hydroelectric generation is one of the renewable sources of energy used within Ontario. It is recognized in the industry as relatively benign environmentally when compared to conventional sources like fossil fuels. Limiting hydroelectric generation likely requires the energy shortfall to be made up with fossil generation and increased acid gas emissions and green house gases.

The small hydroelectric generating stations are for the most part run-of-the-river. Run-of-the-river plants do not put water into storage during lower demand periods. The electricity production does not vary considerably over the course of the day. Annual energy production varies from day to day as the flow in the river or creek changes.

3.2 OTHER USES

Despite the development of hydroelectric generation facilities, the Madawaska River continues to be perceived as a natural, scenic and wild river within the settings of the Madawaska Highlands, Algonquin Provincial Park and the upper Ottawa Valley, which supports numerous water-based, recreational activities. These activities attract users from the local area and the rest of the province, the USA and overseas, and act as the foundation for a tourism industry that makes an important economic contribution to this region. Consequently, it is important to limit conflicts between hydroelectric generation and other uses.

The Madawaska River and its tributaries flow through a number of communities. The communities that the Madawaska River and its main tributaries flow through are listed in Table 3.03. Most communities are listed as a township that is at least partially within the watershed.

Table 3.03: Communities along the Madawaska River

Community	Population	Number of Private Dwellings	Township
McNab/Braeside	7222	2934	yes
Arnprior	7158	3335	town
Madawaska Valley	4381	2974	yes
Hastings Highlands	4033	3671	yes
Bancroft	3838	1849	town
Bonnechere Valley	3665	2195	yes
Highland East	3089	4552	yes
Greater Madawaska	2751	2419	yes
Addington Highlands	2512	2350	yes
Algonquin Highlands	1976	3624	yes
Brudenell, Lyndoch and Raglan	1497	1065	yes
South Algonquin	1253	1201	yes
Carlow / Mayo	950	665	yes

Statistics Canada 2006 Census

Communities that are part of a township are listed at the bottom of the table. The total population living in communities within the Madawaska River watershed is less than 45,000.

A visitor's survey, conducted during the Madawaska River water management review in the summer of 1997 listed swimming, sport fishing, boating, canoeing, visiting Algonquin Provincial Park, and white-water rafting/ kayaking as important water-based recreational activities which attract visitors to the river. Other activities include sightseeing, snowmobiling in the winter and hunting (waterfowl) in autumn. These activities support numerous water-based tourism operations including rental cottages and cabins, commercial lodges and campgrounds, marinas and yacht clubs, kayaking and rafting operations, canoe outfitters, charter boats and sailing tours, public parks and beaches. The influx of tourists attracted to the river also supports other commercial activities indirectly affected by hydroelectric operations such as restaurants, gift shops, off-water motels and guest houses, golf and skiing resorts, and condominium developments.

The nature and intensity of recreational activity varies from river reach to reach. Economic activity along the river consists of resorts, marinas, commercial campgrounds, outdoor adventure businesses and other activities. The commercial revenues associated with these activities are over $17 million per year (Bailly, 1999). A summary of the economic value of these activities along the main stem of the Madawaska River is shown in Table 3.04.

Table 3.04: Commercial Activities

Reach	Start	Resorts	Marinas	Campgrounds	Outdoor	Revenues ($ Millions)
1	Headwaters to Madawaska	2			2	3.3
2	Madawaska to Bark lake	1		5	2	1.7
3	Bark Lake to Palmer Rapids	10	4	3	2	3.7
4	Palmer Rapids to Griffith	2		1	2	Confidential
5	Griffith to Mountain Chute	4	2	4		1.3
6	Mountain Chute to Barrett Chute	2				Confidential
7	Barrett Chute to Calabogie	10		2	1	3.6
8	Calabogie to Stewartville					
9	Stewartville to Arnprior					Confidential
10	Arnprior to the Ottawa River	1	3			1.7
	Total	32	9	15	9	17.4

The majority of the revenues are concentrated in the Reach 1 - Madawaska to headwaters, Reach 3- Bark to Palmer and Reach 7 - Barrett Chute to Calabogie. The Madawaska River Waterway Provincial Park in Reach 4 (Palmer Rapids and Griffith) is used extensively for canoeing and kayaking. Drinking water and waste water treatment facilities exist in Reach 3 and Reach 10. There are 14 registered trap lines and 22 baitfish blocks associated with the main stem of the river.

Flow and water level management can have positive and negative effects on recreation, tourism and other uses. On the positive side, water management during spring freshet provides flood protection to shoreline residences and structures, and can reduce bank erosion. The storage reservoirs can be used to provide more constant flows and water levels during the peak summer recreational period. Stable flows and water levels are also provided for boating, canoeing and kayaking. Bark Lake daily discharge is managed by OPG to provide high hourly flows for white-water kayaking and rafting. Conversely, seasonal, weekly and hourly flow fluctuations at the dams and stations can pose a threat to the sport fishery by affecting the reproductive success of fish or the secondary productivity of the lake littoral zones. High and low flows and water levels may affect boating sailing, canoeing and float plane operations. Beaches, docks and boat ramps may be alternatively flooded or de-watered. The winter drawdown of reservoirs may create dangerous ice conditions for snowmobiling and ice fishing. Water levels that are too constant in the summer may reduce productivity of wetlands for waterfowl while the river may flood waterfowl nests in the spring.

Historically, OPG has tried to accommodate other uses of the river such as recreation and tourism needs. While some traditional activities such as angling have always been important recreational (and subsistence) activities on the river, recreation and tourism have expanded considerably since the completion of Highway 60 in 1936, and Highways 17 and 41 in more recent years, bringing them into conflict with the power generation industry. Until 1942, OPG operations used the storage of the headwater lakes. Conflicts developed from time to time with tourism in general and cottage owners in particular.

In 1942, a decision was made to withdraw from active use of the small headwater lakes and replace them with a single large storage reservoir at Bark Lake. Bark Lake now absorbs most of the impacts of the seasonal water management. To limit seasonal impacts on Bark Lake and downstream lakes, OPG subsequently limits the use of storage from the dams and facilities, so that water levels are held within a very small band on most lakes for the primary recreational season of Victoria Day weekend to the Thanksgiving weekend.

In 1962, OPG decided to develop the river for peaking operation. From 1967 to 1977, Mountain Chute GS and Arnprior GS were constructed and Barrett Chute GS and Stewartville GS expanded. Peaking operations lead to new conflicts between hydroelectric generation and recreation and tourism. The conflicts over levels and flows on the river have continued to evolve. The WMP specifies the level and flow requirements that OPG is obligated to follow. Many of these requirements represent compromises to the decades of evolution of conflicts between hydroelectric generation and other uses.

There are over 1,600 residences on the main stem of the river. The number of residences in each reach as calculated by (Bailly, 1999) are listed in Table 3.05. The largest concentration of residences is located in Reach 3, with about 42 percent of the residences along the main stem of the river. The next largest is Reach 5 with about 15 percent of the residences. Peaking operations and use of seasonal storage has the ability to influence the quality of recreational activities in each reach.

Table 3.05: Residences

Reach		# of residences	%
1	Headwaters to Madawaska	58	3.6
2	Madawaska to Bark Lake	80	5.0
3	Bark Lake to Palmer Rapids	670	41.8
4	Palmer Rapids to Griffith	76	4.7
5	Griffith to Mountain Chute	245	15.3
6	Mountain Chute to Barrett Chute	58	3.6
7	Barrett Chute to Calabogie	195	12.2
8	Calabogie to Stewartville	162	10.1
9	Stewartville to Arnprior	45	2.8
10	Arnprior to the Ottawa River	15	0.9

Angling is intensive on all lakes and reservoirs within the Madawaska system and is a major attraction for tourists. The effect of hydroelectric operations on the sport fishery is an important issue for the Madawaska River Water Management Plan. By means of this, MNR and OPG are working together to mitigate problems, enhance habitats and maintain fisheries to sustain angling and recreational opportunities for the future users of the Madawaska River.

Table 3.06 shows the sensitivity to level and flow changes by reach as derived by (Bailly, 1999). The information in Table 3.06 was developed through discussions with stakeholders and a review of literature. Reach sensitivity was classified as Low (L), Medium (M) and High (H). Blank cells indicate that the activity was not impacted by hydroelectric generation activities.

Table 3.06: Reach Sensitivity to Changes in Levels and Flows

Reach	1	2	3	4	5	6	7	8	9	10
Resorts	H	H	L	L	M	L	M			L
Marinas			L		L					H
Camp Grounds		H	M	L	M		M			
Outdoor Businesses	M	L	H	H			M			
Recreational Facilities	M	M		H	L			L		
Recreational Activities	M	M	H	H	H		H	H		L
Residences	M	H	M	L	M	L	M	M	M	M
Other			M							H

4 HYDROELECTRIC GENERATING STATIONS AND OTHER DAMS

The purpose of this section is to provide a general description and history of the dams currently in place on the Madawaska River and its tributaries.

The information in this section is divided into five subsections based on the location of the structure. These subsections are:

- Main channel of the Madawaska River
- Opeongo River
- York River
- Waba Creek
- Other Tributaries

Within each subsection, structures are presented based on their location in the basin, starting at the highest point of the watercourse (most upstream dam) to lowest point of the watercourse. The main tributaries as well as the location of dams and hydroelectric facilities throughout the watershed are shown in Figure 4.01.

The description of each structure included in this section provides some or all of the following information:

- location
- history of development
- dimensions of the dam and spillways
- operating consideration
- operational status
- indication of the presence of water level monitoring equipment

Operational limits, constraints and general operating patterns for each structure are provided in section 9.

There are 41 dams on the Madawaska River (Figure 4.01) and its tributaries, of which five have been decommissioned and 14 are not operated. The flow through the 23 operational dams can be increased or decreased by an operator to manage flows and levels. The flow through the 14 non-operational dams can not be adjusted, and will increase and decrease depending on water supply conditions.

Please refer to Figure 4.01: Madawaska River Watershed.

4.1 MADAWASKA RIVER

There are 12 dams on the main channel of the Madawaska River (Figure 4.02). MNR owns four of the dams. OPG owns the remaining eight dams. The main channel extends from Cache Lake to its outlet near Arnprior.

Please refer to Figure 4.02: Dams on the Madawaska River.

4.1.1 Cache Lake Dam - MNR Algonquin Park

Cache Lake Dam is located at the eastern outlet of Cache Lake which is a major access point to the interior of Algonquin Provincial Park. The lake is popular for day use recreation and is home to a resort lodge, two youth camps and 62 private cottages.

The Cache Lake Dam is 3.8 m high by 30 m long. The flow through the dam is controlled by a 4.3 m long log sluice and a 12.2 m long weir with a crest elevation of 28.5 m (93.50 ft) Local Datum (LD). The primary function of the dam is to maintain water levels for recreational use. A water level gauge is installed on the upstream side of the dam.

Naturally reproducing lake trout and bass are given spawning consideration during the fall and spring operation of the dam. Other consideration for operations is given for navigation through the channel between Cache Lake and Tanamakoon Lake.

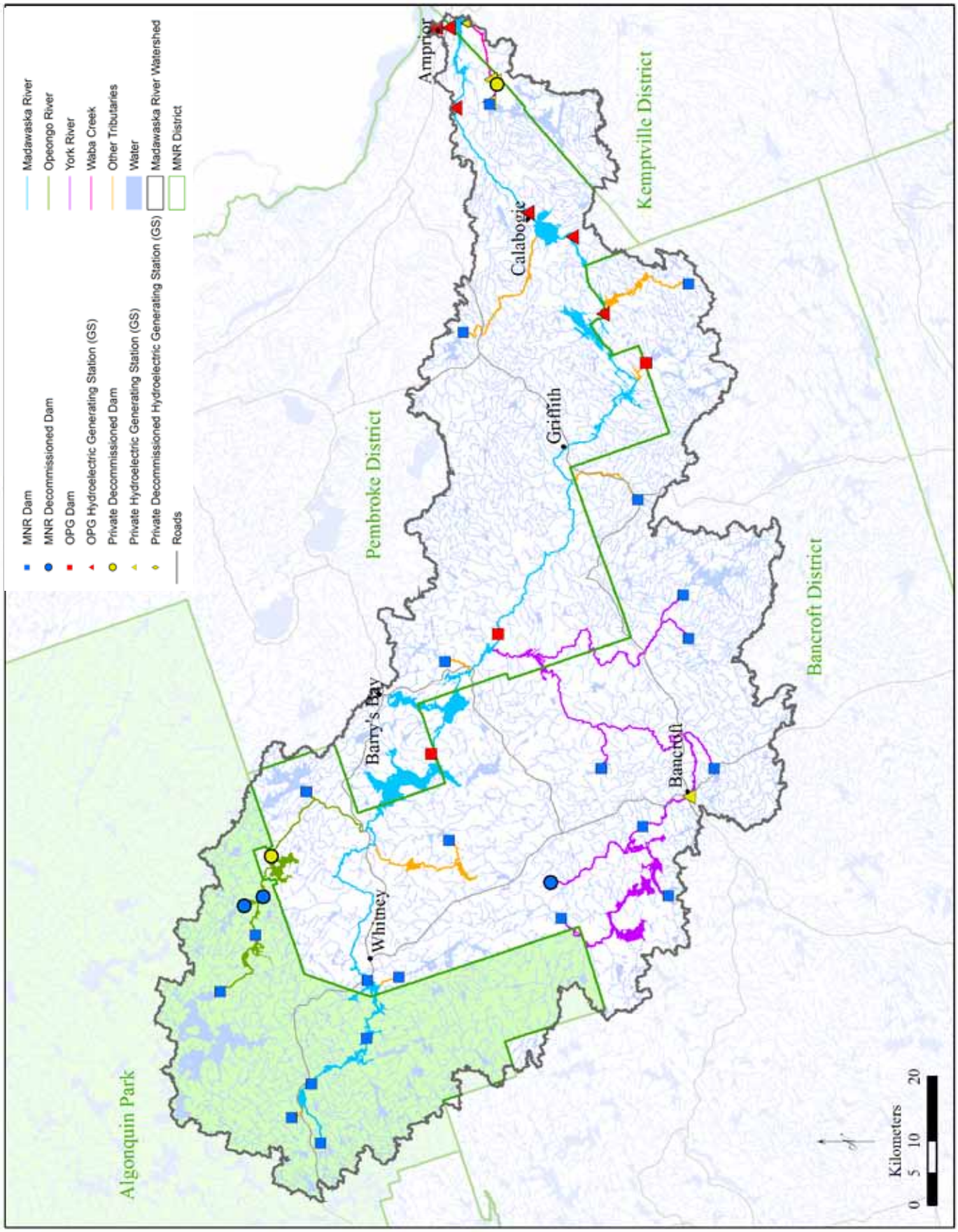


Figure 4.01: Madawaska River Watershed

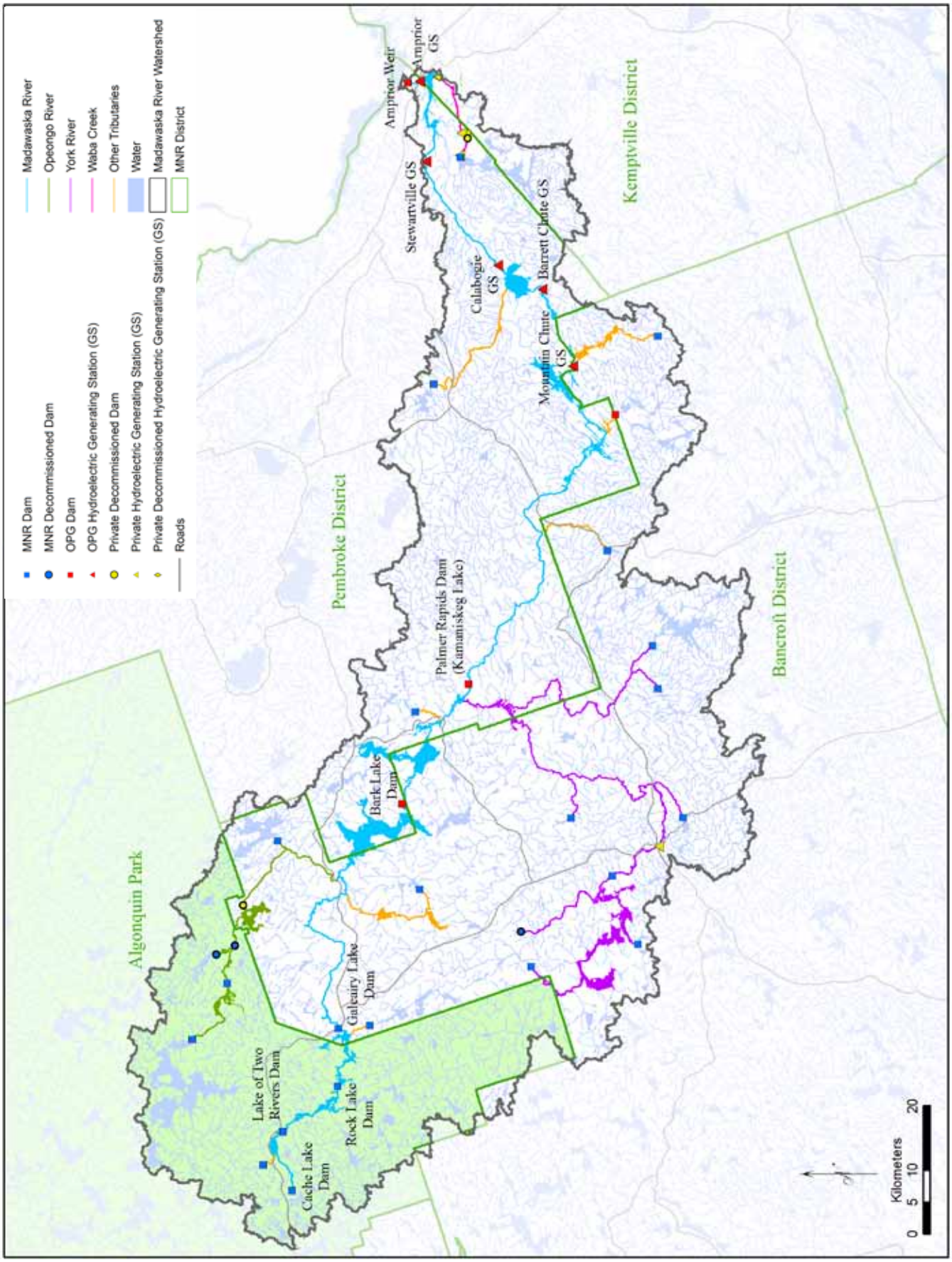


Figure 4.02: Dams on the Madawaska River

4.1.2 Lake of Two Rivers Dam - MNR Algonquin Park

Located along the Highway 60 corridor in Algonquin Provincial Park, Lake of Two Rivers is a popular tourism area. There are two public campgrounds in the vicinity, one on Lake of Two Rivers and the other on nearby Pog Lake. There are also two day-use recreational areas, a resort lodge, and seven private cottages on the lake.

The Lake of Two Rivers dam is 3.0 m high by 46 m long with four log sluices. Each of the log sluices is 4.3 m long with a sill elevation 25.30 m (83.00 ft) LD. A timber crib dam was constructed in 1948 and was subsequently replaced with a concrete dam in 1965. A water level gauge is located on the upstream face of the dam.

The operation of the Lake of Two Rivers Dam takes into consideration recreational uses and spawning conditions in the fall and summer months for the naturally reproducing lake trout and bass.

4.1.3 Rock Lake Dam - MNR Algonquin Park

The Rock Lake Dam is located on the Madawaska River south of the Highway 60 corridor, near the south east corner of Algonquin Provincial Park. Logging interests led to the constructionof a dam to control the level of Rock Lake in approximately 1900. The original facility was built 800 m upstream of the existing facility. The Rock Lake Dam controls the discharge out of Rock Lake and Whitefish Lake.

The Rock Lake Dam is 2.3 m high by 106 m long with two log sluices and a concrete weir. The south sluice is 6.1 m long with a sill elevation of 388.77 CGD. The north sluice is 4.4 m long with a sill elevation of 389.1 CGD. The winches and decks have been removed from both sluices, and the logs are permanently set in place. The entire structure is not operated and acts as a weir at the outlet of Rock Lake. The Rock Lake Dam was rebuilt in 1941 to maintain water levels for recreation and has not been operated since about 1979. There is no water level gauge at this dam.

4.1.4 Galeairy Lake Dam - MNR Bancroft

Galeairy Lake serves as a major canoe access route into Algonquin Provincial Park as the majority of its boundary is located within the park. Development on the lake consists of two lodges, numerous permanent residences and approximately 20 seasonal cottages. The Galeairy Lake Dam, at the outlet of Galeairy Lake, is located outside of the Algonquin Provincial Park boundary in the community of Whitney.

The Galeairy Lake Dam is 4.1 m high by 108 m long with six log sluices. Each of the log sluices are 4.9 m long with a sill elevation 387.70 m Canadian Geodetic Datum (CGD). The original timber frame structure was built in the late 1800s for logging purposes. The current concrete dam was re-built in 1951. A water level gauge is installed at the dam.

The operation of the Galeairy Lake Dam takes into consideration flooding, recreational uses and spawning conditions in the fall and spring for lake trout and bass as well as spawning downstream of the dam for whitefish and walleye.

4.1.5 Bark Lake Dam - OPG

Bark Lake Dam is located in Jones Township Concession I lots 12 & 13.The original dam was an 84 m long timber crib dam built in 1880 by a logging company. The dam was purchased and repaired by OPG in 1929. The existing dam was rebuilt by 1942. The reservoir created by the construction of the dam flooded 1700 ha of additional land and raised the level of Bark Lake 7.6 m above the operating maximum of the original dam. The re-construction of the dam required relocating 24 km of highway, which included a bridge, movement of several buildings in the Town of Madawaska, reconstruction of a rail bridge and removal of railway facilities, including a round house.

The Bark Lake dam consists of a main dam 20 m high by 300 m long for water control with five log sluices and four valves and one log chute. Each of the log sluices are 4.9 m long with a sill elevation of 307.85 m CGD. The diameter of each of the valves is 1.68 m. The non-functioning log chute is 3 m long with a sill elevation of 309.37 m. The total discharge capability of the Bark Lake Dam is 730 m^3/s. A water level gauge is installed at the dam.

The operation of the Bark Lake dam is based on an annual cycle. The lake is lowered prior to the spring melt and refilled during the spring. Operation of the dam takes into consideration energy demands, downstream flooding on the Madawaska and Ottawa Rivers, recreational opportunities as well as spawning activities by walleye and other species of fish.

4.1.6 Palmer Rapids Dam (Kamaniskeg Lake) - OPG

Palmer Rapids Dam is located in Raglan Township Concession 19, lots 18 and 19. The original dam was a timber crib dam built in 1881 by a logging company. The dam was purchased by OPG in 1929. OPG and logging interests on the river rebuilt the dam in 1931. However, significant damages to the dam occurred before spring melt in 1932. OPG rebuilt the dam in 1942. Significant repairs were carried out in 1944 and 1950 because of damages to the structure by high flows and flooding. Reconstruction of the entire dam occurred in 1957. Channel excavations to increase the discharge capacity were carried out in 1967.

The Palmer Rapids dam consists of the North Channel dam 8 m high by 53 m long and the South Channel dam 10 m high by 130 m long for water control with 12 log sluices.

Each of the log sluices are 4.3 m long with sill elevations that vary between 279.81 m to 281.33 m CGD. The total discharge capability of the dam is 370 m^3/s. A water level gauge is installed at the dam.

The operation of the dam is based on an annual cycle. The lake level usually rises during periods of high inflow which typically occurs in the spring. Operation of the dam takes into consideration energy demands, downstream flooding on the Madawaska and Ottawa Rivers, recreational opportunities, the muskrat population, as well as walleye spawning activities.

4.1.7 Mountain Chute Generating Station - OPG

Mountain Chute GS is located in North Conato Township Concession 9, Lot 17. In 1901, a mining company built a small power development at Mountain Chute. OPG purchased the mine and power plant in 1947. Construction of the GS began in 1965. The generating units came into service in 1967. The reservoir created by the construction of the facility covers 35 km^2 and required the clearing of 22 km^2 of land. Construction of the GS required construction of an access road 6 km long and improvements and reconstruction of 16 km of Highway. The construction of the Mountain Chute GS was part of an overall plan to increase the peaking potential of the Madawaska River. The capacity of the GS is 170 MW.

The Mountain Chute GS consists of the main dam 55 m high by 440 m long, the North Block dam 12 m high by 130 m long and the Whitefish draw dam 15 m high by 200 m long consisting of two generating units and two gate sluices. Each of the gate sluices are 8.8 m long with a sill elevation of 239.27 m CGD. The total discharge capability of the Mountain Chute GS is 1400 m^3/s. Mountain Chute GS operates as a peaking plant in conjunction with the four other OPG-owned facilities on the Madawaska River. A water level gauge is installed at the GS.

The operation of the GS is based on an annual cycle. The reservoir elevation is lowered prior to the spring melt and refilled during the spring. Operation of the GS takes into consideration energy demands, downstream flooding on the Madawaska and Ottawa Rivers, recreational opportunities as well as spawning activities by walleye and other species of fish.

4.1.8 Barrett Chute Generating Station - OPG

Barrett Chute GS is located in Blythfield Township Concession 13 and 14, lots 13-15. The facility was built at the location of a series of falls and rapids, including Chain Rapids, Ragged Rapid, High Falls and Barrett Chute. Cribbing, flumes and a rock cut were constructed to facilitate log driving through the various rapids. Construction of the GS started in 1940 with the two original generating units entering into service in 1942.

The reservoir created by the construction of the GS covers 1500 ha and extends upstream for a distance of approximately 13 km to the foot of the Mountain Chute rapids. The headpond created a flat stretch of water about 21 m deep at the development site. Two additional generating units were installed in the spring of 1968 to increase the peaking potential of the Madawaska River and required excavation of the power canal. The capacity of the GS is 176 MW.

The Barrett Chute GS consists of the main dam 28 m high by 340 m long and the Headworks dam 12 m high by 110 m long with four generating units, two gate sluices and six log sluices. Each of the log sluices are 4.9 m long with a sill elevation of 195.07 m CGD. Each of the gate sluices are 4.5 m long with a sill elevation of 192.02 m CGD. The total discharge capability of the Barrett Chute GS is 1700 m^3/s.The Barrett Chute GS operates as a peaking plant in conjunction with the four other OPG owned facilities on the Madawaska River. A water level gauge is installed at the GS.

The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.

4.1.9 Calabogie Generating Station - OPG

Calabogie GS is located in Bagot Township Concession 9, lots 17 and 18. The Calabogie GS was built over a seven month period in 1917 and purchased in 1929 by OPG. The GS was built at the outlet of the Calabogie Lake. Prior to site development the river diverted into two channels for a distance of 1.6 km. The difference in height between the original rapids and the lake was about 8 m. Increasing the peaking potential of the river in the 1960 involved the rehabilitation and addition of three gate sluices on the South Channel Dam, enlargement of the power canal and repairs to the North Channel dam. The capacity of the GS is 4 MW.

The Calabogie GS consists of a Main South Channel dam 12 m high by 110 m long, North Channel Dam 5 m high by 41 m long, intake dam 5 m high by 38 m long and powerhouse 8.5 m high by 220 m long with two generating units, three gate sluices and ten log sluices. Each of the log sluices are 6.1 m long with a sill elevation that varies between 150.20 and 151.42 m CGD. Each of the gate sluices are 4.5 m long with a sill elevation of 148.74 m CGD. The total discharge capability of the Calabogie GS is 950 m^3/s. A water level gauge is installed at the GS.

The Calabogie GS operates as a peaking plant in conjunction with the four other OPG owned GS on the Madawaska River. Although the generating units at the station have limited flow capacity, the units and sluice gates are integrated with the rest of the peaking system on the Madawaska River. Calabogie is a generation bottleneck on

the Madawaska River. The small turbine capacity results in frequent spill past the station.

The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.

4.1.10 Stewartville Generating Station - OPG

Stewartville GS is located in McNab Township, Concession 6, lots 11-15. Preliminary work got underway during the fall of 1945. The first three generating units were in service by 1948. The construction of the Stewartville GS also required the construction of the Burnstown Bridge about 6 km above the dam and the Springtown Bridge a few kilometres farther up the river due to the high water levels which were to prevail after the completion of the development. At Burnstown, the new water level is some 12 m higher than the pre-development level. Two additional generating units were installed in the spring of 1969 to increase the peaking potential of the Madawaska River. The capacity of the GS is 182 MW.

The reservoir created by the construction of the GS covers 450 ha and extends upstream for a distance of approximately 21 km. The reservoir is about 46 m deep at the development site.

The Stewartville GS consists of the main dam 63 m high by 440 m long with five generating units, two gate sluices and two log sluices. Both of the log sluices are 4.3 m long with a sill elevation of 138.68 m CGD. Each of the gate sluices are 10.7 m long with a sill elevation of 147.16 m CGD. The total discharge capability of the Stewartville GS is 1580 m^3/s. The Stewartville GS operates as a peaking plant in conjunction with the four other OPG-owned GS on the Madawaska River.

The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands, recreational opportunities as well as spawning activities by walleye and other species of fish.

4.1.11 Arnprior Generating Station - OPG

Arnprior GS is located in Concession B, Lot 1, in the geographic Township of McNab. In 1971, OPG decided to proceed with the construction of the GS to correct environmental problems associated with the water level fluctuations, bank erosion and turbidity along the lower Madawaska. The decision to build the Arnprior station was subject to three conditions. Firstly, geological conditions had to be satisfactory. Secondly, the project had to be acceptable to regulating authorities and the Arnprior community. Thirdly, with the predicted improvement in environmental conditions along the lower Madawaska, operation as peaking plants would continue.

Construction started in the spring of 1973 and the second unit was in service in 1977. The construction of the Arnprior GS also required the construction of a four-lane bridge on Highway 17; a semi-circular overflow control weir to replace the existing control weir in the town of Arnprior; a bridge at a higher level for White Lake Road to replace the existing bridge which was flooded by the reservoir; relocation of the section of CP railway; and channel improvements to the tailrace between Arnprior

generating station and Chats Lake (Ottawa River). The site, which was selected for four-lane bridge structure on Highway 17 by the Ministry of Transportation and Communication, was coordinated with the tailrace control weir.

The reservoir created by the construction of the GS is about 930 ha and 16 km long, extending up to the tailrace of the Stewartville generating station. A total of 720 ha was flooded and 82 km of new shoreline created.

The Arnprior GS consists of the main dam 35 m high by 810 m long, and the Waba Block Dam, 18 m high by 1100 m long with two generating units, three gate sluices and three emergency sluices. Each of the gate sluices are 6.9 m long with a sill elevation of 88.92 m CGD. The total discharge capability of the Arnprior GS is 1900 m^3/s. The Arnprior GS operates as a peaking plant in conjunction with the four other OPG-owned GSs on the Madawaska River. The capacity of the GS is 82 MW.

The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands and recreational opportunities.

4.1.12 Arnprior Weir - OPG

The Arnprior Weir was built in 1976 as part of the Arnprior GS development. A semi-circular overflow control weir was built to replace the existing control weir in the town of Arnprior.

The Arnprior Weir is 4.3 m high by 305 m long. A water level gauge is not installed at the dam.

4.2 OPEONGO RIVER TRIBUTARY

There are six dams on the Opeongo River Tributary (Figure 4.15). Five of the dams are owned by the MNR and one dam is privately owned. The Opeongo Tributary extends from the outlet of Opeongo Lake, includes the flows from Aylen Lake, to where it enters the main stem of the Madawaska River above Bark Lake.

Please refer to Figure 4.03: Dams on the Opeongo River Tributary.

4.2.1 Opeongo Lake Dam - MNR Algonquin Park

Opeongo Lake is located within Algonquin Provincial Park and is a major access point to Algonquin Park interior (160+ interior campsites). There are major wetlands in the area: Hailstorm Creek, Costello Creek, Jones Bay. MNR Harkness Laboratory of Fisheries Research, established in 1935, is a major research facility in the area.

The original dam was built between 1860 and 1880 by a logging company. The dam was rebuilt in 1930 by another logging company. MNR took over ownership of the dam in 1941. The current concrete dam was built in 1955 to replace the timber crib dam that was located 23 m downstream.

Opeongo Lake Dam is 3.4 m high by 112 m long with three log sluices. Each of the log sluices are 4.3 m long with a sill elevation 27.1 m (89 ft) LD. A water level gauge is installed on the lake. MNR is expected to replace the existing dam with a weir and as a result, MNR's Class Environmental Assessment for Resource Stewardship

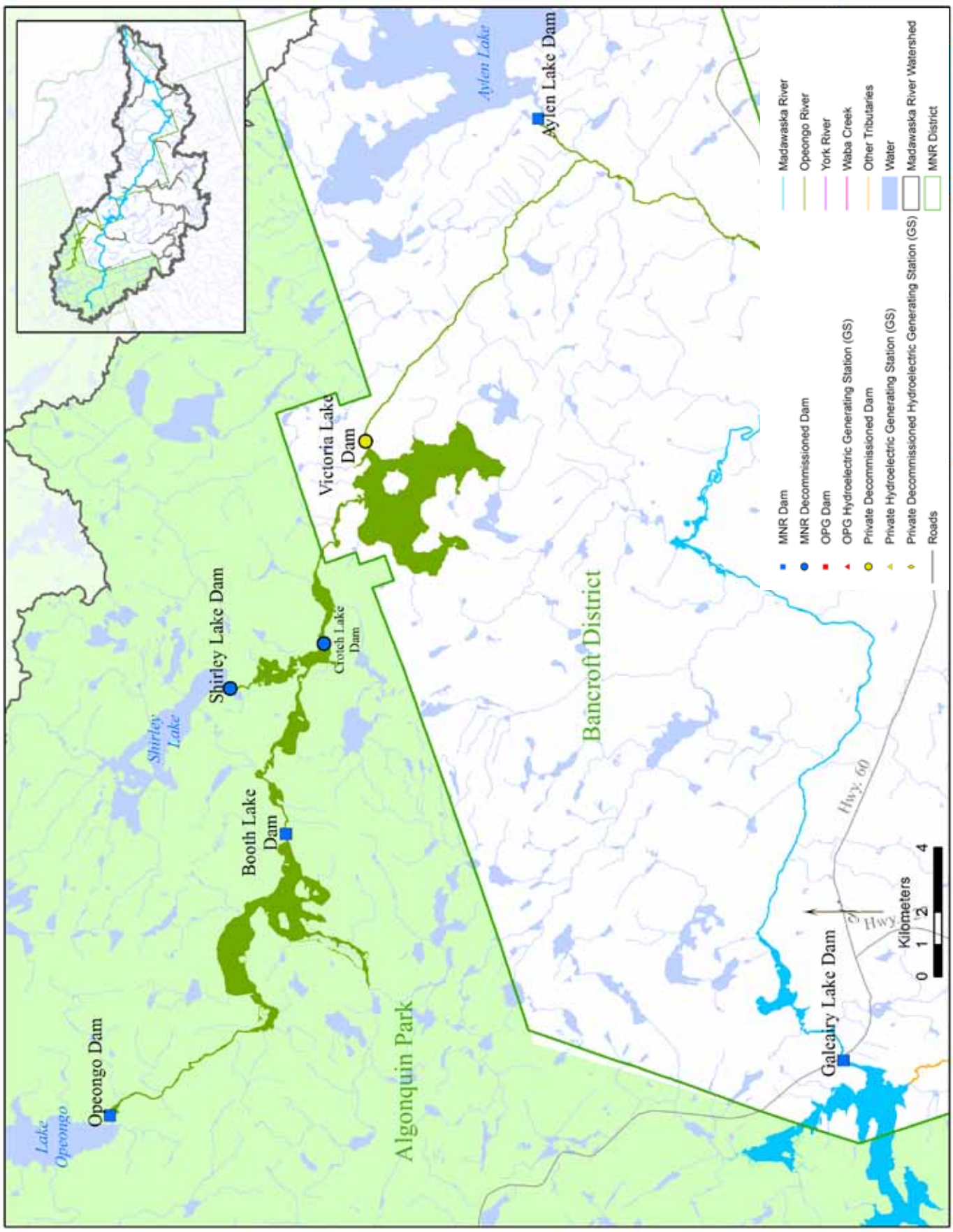


Figure 4.03: Dams on the Opeongo River Tributary.

and Facility Development projects were initiated and are currently nearing completion. The preferred option selected is the replacement of the existing structure with a weir. The crest of the weir will be set at an elevation of 94.5 feet LD, which represents the existing, normal, summer elevation. The dam will have a notch to allow for downstream flows throughout the year. Exact construction design and details are being finalized.

The operation of the dam also takes into account spawning consideration during the fall and spring for naturally reproducing lake trout and bass. Additional consideration is given to navigation through shallow narrows into the East arm of the lake.

4.2.2 Booth Lake Dam - MNR Algonquin Park

The dam is located on the Opeongo River, between Lake Opeongo and Bark Lake. The original dam was built in approximately 1865 by a logging company. The dam was rebuilt in 1931 by another logging company. MNR took over ownership of the dam in 1941. The current structure was built in 1958. The Booth Lake Dam is 4.0 m high by 60.4 m long with four log sluices. Each of the log sluices are 4.3 m long with a sill elevation of 28.0 or 27.7 m LD. A water level gauge is not installed at the dam. The Booth Lake log sluices have not been operated in over 30 years.

Logs are permanently set in the sluices and the dam acts as a weir. The unchanged log setting allows for both stable recreational levels and the maintenance of the Booth Lake Bog along McCarthy Creek.

4.2.3 Shirley Lake Dam (Decommissioned) - MNR Algonquin Park

The remains of the dam are located at the outlet of Shirley Lake just north of the Opeongo River, near the east border of Algonquin Provincial Park. The dam was originally built in 1925 by a logging company and the MNR took over ownership of the dam in 1941. The dam has not been operated since the 1950's. The remains of the original timber crib dam has no control or influence on the flow out of Shirley Lake.

4.2.4 Crotch Lake Dam (Decommissioned) - MNR Algonquin Park

The remains of this dam are located at the outlet of Crotch Lake.

4.2.5 Victoria Lake Dam (Decommissioned) - Private

The remains of this dam are located about 305 m downstream from the natural outlet of Lake Victoria. The original dam was built in 1865 by a logging company and acted as a weir. The dam was rebuilt in 1930 by another logging company. MNR took over ownership of the dam in 1941. As of 1967, the dam was considered incapable of controlling water levels on Lake Victoria. The dam is now owned by property owners on Victoria Lake.

4.2.6 Aylen Lake Dam - MNR Bancroft

The Aylen Lake Dam is located at the outlet of Aylen Lake on the Opeongo River in Dickens Township. The

dam is on the Aylen Lake Road and functions as a bridge. The original dam was built in the 1880s on behalf of local logging companies.

The dam is a 4.3 m high by 25 m long concrete and earth embankment structure initially constructed in 1963. The dam consists of a single 4.3 m long log sluice. An imperial water level gauge is installed at the dam.

Consideration is given in the operations of the dam to facilitate the fall lake trout spawn and subsequent emergence and recreational uses.

4.3 YORK RIVER TRIBUTARY

There are nine dams on the York River (Figure 4.19). MNR owns eight of the dams and Bancroft Light and Power (BLP) owns one GS. The York River Tributary includes the dams along the York River and the Little Mississippi River. Conroy's Marsh, the confluence of these two rivers, outlets into the Madawaska River just above the Palmer Rapids Dam.

Please refer to Figure 4.04: Dams on the York River.

4.3.1 Sandox Lake Dam (Decommissioned) - MNR Bancroft

The Sandox Lake Dam is in McClure Township and is located towards the south end of Sandox Lake. The dam is on McGarry Creek, which is a tributary to the York River system.

The Sandox Lake Dam was a 1.8 m high by 4.8 m long concrete gravity dam. The majority of the concrete dam has failed and washed away. A beaver dam has been constructed at the site and encompasses the remains of the original dam. A water level gauge is not installed at this site.

The dam was constructed in 1969 to control water levels for the purpose of manipulating fish spawning activities in Sandox Lake. This dam has not been operated nor maintained since at least 1995. The dam failed in 1995. The beaver dam controls water levels due to the dam failure.

4.3.2 Mink Lake Dam - MNR Bancroft

The Mink Lake Dam is in McClure Township and is located on the south end of Mink Lake. The dam is on Mink Creek which is a tributary to the York River.

The Mink Lake Dam is 2.4 m high by 43 m long with a weir. The weir is 28 m long with a crest elevation of 406.9 m CGD. The original dam was built at the outlet of Mink Lake prior to 1950. The original dam was used to elevate the water level in Mink Lake for the purposes of logging. The dam was later abandoned and not maintained for over a decade. In 1968 a new access bridge was installed to reach the Mink Lake Dam and the existing timber crib dam was constructed near the site of the original dam.

The dam was built to maintain levels for recreational uses. A water level gauge is not installed at this site.

4.3.3 Diamond Lake Dam - MNR Bancroft

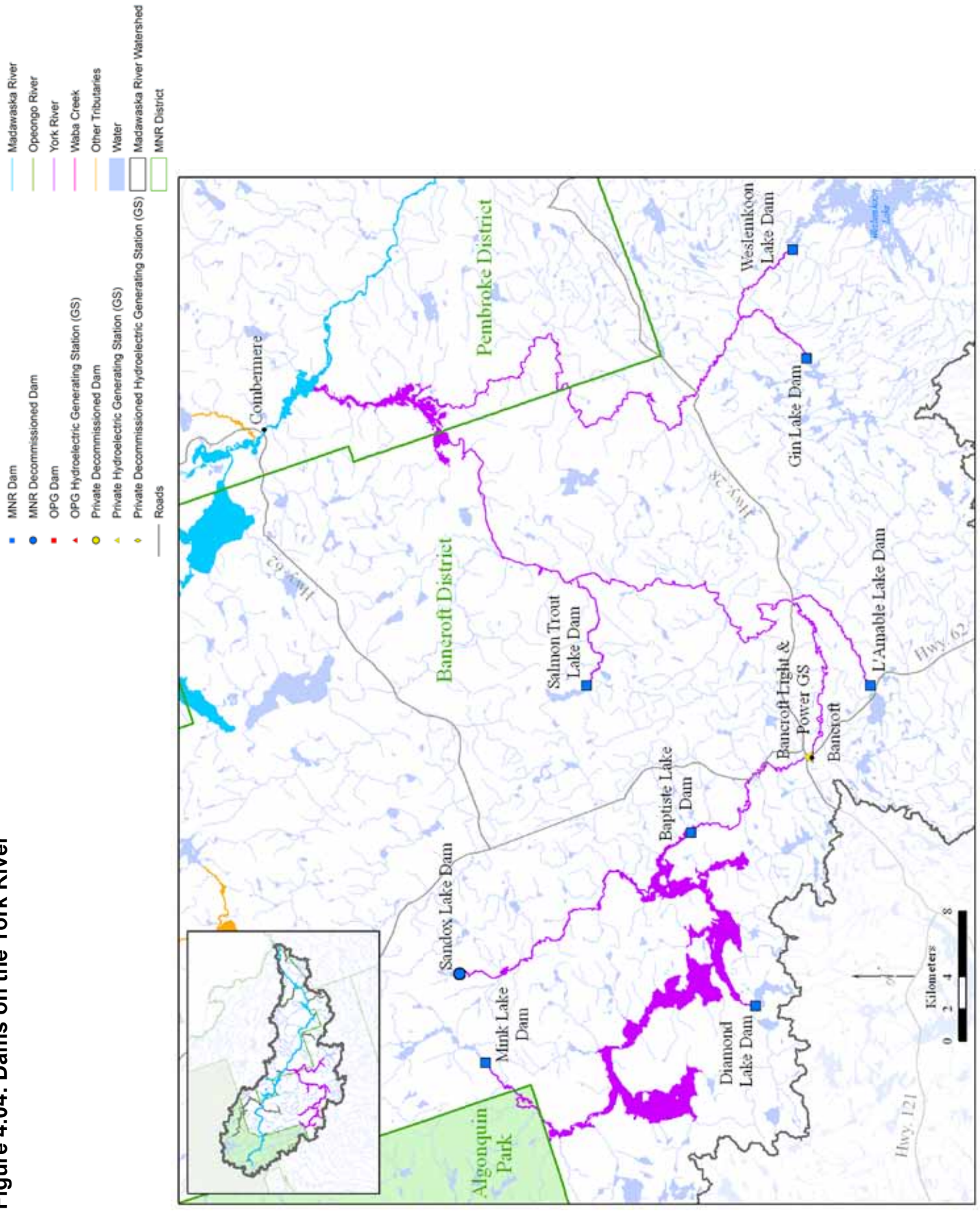


Figure 4.04: Dams on the York River

The Diamond Lake Dam is in Herschel Township and is located on the north end of Diamond Lake. Diamond Lake flows into Baptiste Lake.

The dam is 0.50 m high by 6.7 m long with one log sluice. The log sluice is 2.46 m long with a sill elevation of 374.14 m CGD. The dam was constructed in 1966 to maintaining the reservoir levels in Diamond Lake and to avoid flooding of nearby roads during the spring runoff season. The dam has not been operated since 1967. A water level gauge is not installed at this site. A downstream municipal culvert has controlled the flow out of Diamond Lake since the 1980's.

4.3.4 Baptiste Lake Dam - MNR Bancroft

The Baptiste Lake Dam is located approximately 6 km north of Bancroft and is northwest of the hamlet of Birds Creek. The original dam was built prior to 1929 by a logging company. In 1931 a concrete dam was built at the site. MNR took over ownership of the dam in 1956. The current dam was built in 1966 and is located 10 m downstream of the 1931 dam.

Baptiste Lake Dam is 6.9 m high by 112m long with four log sluices, one gate and a weir. Each of the log sluices are 4.3 m long with a sill elevation of 26.8 m (88 ft) LD. The gate is 1.1 m long by 1.1 m high with a sill elevation of 26.8 m (88 ft) LD. The weir is 61 m long with a crest elevation of 29.9 m (98 ft). An imperial water level gauge is installed at the dam.

Operating considerations include recreational use, potable water supply, flood control, as well as lake trout and the walleye/muskellunge fishery.

4.3.5 Bancroft Light & Power GS - Bancroft Light & Power

The original dam was built in the 1880s. The GS is located in downtown Bancroft. The site was used for saw, grist and woolen mills. Hydroelectric generation began at the site in 1930. The BLPGS consists of a power canal and three log sluices. The capacity of the GS is 600 kW. A water level gauge is installed at this site.

4.3.6 L'Amable Lake - MNR Bancroft

L'Amable Lake Dam is in Dungannon Township just south of Bancroft and is located towards the east end of L'Amable Lake. The dam is on L'Amable Creek, which is a tributary to the York River.

L'Amable Dam is 4.3 m high by 57 m long with one log sluice and a weir. The log sluice is 4.62 m long with a sill elevation of 312.91 m CGD. The weir is 21.5 m long with a crest elevation of 314.74 m CGD. A cement dam was constructed in 1969 to replace a mill and dam structure

on site. The dam was reconstructed and a log sluice added in 1983 to improve the ability to manage water levels in L'Amable Lake for the intention of flood control and to enhance recreation, trout spawning and fish habitat. The dam is no longer operated and functions as a weir. Previously, from 1983 to 1994, the water level control plan consisted of simply adding a half log (15.24 cm) during the spring and taking the half log out in the fall. A water level gauge is installed at this site.

4.3.7 Salmon Trout Lake Dam - MNR Bancroft

The Salmon Trout Lake Dam is north of Bancroft in Monteagle Township and is located on the south end of Salmon Trout Lake. The dam is on Salmon Trout Creek, which flows east into the York River.

Salmon Trout Lake Dam is 0.79 m high by 7.1 m long with one log sluice. The log sluice is 2.4 m long with a sill elevation of 376.11 m CGD. The dam was built in 1965 and replaced a beaver dam which had failed. The purpose of the dam was to provide consistent water levels. The log sluice is no longer operated and functions as a weir. Installation of permanent stop logs took place in 1988. A water level gauge is not installed at the dam.

4.3.8 Gin Lake Dam - MNR Bancroft

The Gin Lake Dam is in Mayo Township and is located towards the northeast end of Gin Lake. The dam is on Gin Creek which is a tributary to the Little Mississippi River. The Little Mississippi River flows into Conroy's Marsh, just above the Palmer Rapids Dam.

Gin Lake Dam is 1.2 m high by 28 m long with a single log sluice. The log sluice is 4.3 m long with a sill elevation of 354.53 m CGD. The dam was built in 1975 to manage water levels in Gin Creek for the intention of flood control for nearby residences on Gin Creek and provide for recreational usage on Gin and Mayo Lakes. The increased water levels in Gin Lake, as a result of the dam construction, allow for easier travel through the narrows between Gin Lake and Mayo Lake. A water level gauge is not installed at this site.

The dam is not operated and functions as a weir.

4.3.9 Weslemkoon Lake Dam - MNR Bancroft

The Weslemkoon Lake dam is in Ashby Township and is located towards the end of Weslemkoon Lake. Weslemkoon Lake flows into the Little Mississippi River.

The Weslemkoon Lake dam was originally a timber structure, but was replaced in the autumn of 1938 by a concrete structure. It was rebuilt in 1952 to better maintain the reservoir levels in Weslemkoon Lake.

The dam is a 3.8 m high by 16 m long with a single log sluice and two weirs. The log sluice is 4.9 m long with a sill elevation of 313.98 m CGD. Both weirs are 4.6 m long with a crest elevation of 316.89 m CGD. The overflow weirs are located to either side of the main spillway.

The dam is currently operated by the Weslemkoon Lake Cottagers Association during the summer season and by MNR during the remainder of the year. Water levels are maintained for recreation and for Lake Trout spawning in the fall. Flow releases are maintained below 34 m^3s to protect a downstream bridge. A water level gauge is installed at the dam on the right wing wall.

4.4 WABA CREEK TRIBUTARY

There are six dams on the Waba Creek Tributary (Figure 4.28). MNR owns one dam and there are three small privately owned GSs. In addition, there are two privately owned decommissioned structures, a dam and a GS. Waba Creek originates on the north side of White Lake in the municipality of McNab-Braeside and continues for approximately 14 km before reaching its outlet at Lake Madawaska.

All three waterpower operations rely solely on the flow they receive from MNR's White Lake Dam. They are run-of-the river operations and as such have minimal to no control over the flow in the creek. The levels and flows of Waba Creek have little to no impact on the levels and flows of the Madawaska River.

Please refer to Figure 4.05: Dams on Waba Creek.

4.4.1 White Lake Dam - MNR Pembroke

The White Lake Dam falls within the administrative boundaries of the MNR Pembroke District; however, Kemptville District is responsible for its maintenance and operation as the lake is managed by Kemptville District for fisheries. The current operation and minor maintenance is completed under a contractual agreement.

The original White Lake Dam was built in 1845 with the purpose of providing water storage for the operation of a logging mill at Waba, 4 km downstream. The dam was rebuilt in 1948 and in 1969, was purchased by the MNR and reconstructed again.

The White Lake Dam is 2.7 m high by 29 m long with three log sluices. The sluices at each end are 4.27 m long with a sill elevation of 160.96 m (528.08 ft) CGD. The middle sluice is 2.44 m long with a sill elevation of 160.96 m (528.08 ft) CGD . The smaller middle sluice was initially incorporated into the design of the dam to permit the passage of logs through the dam to the downstream sawmill at Waba. An imperial water level gauge is installed at the dam.

Operating considerations include recreational use, walleye and northern pike spawning and the downstream aquatic ecosystem.

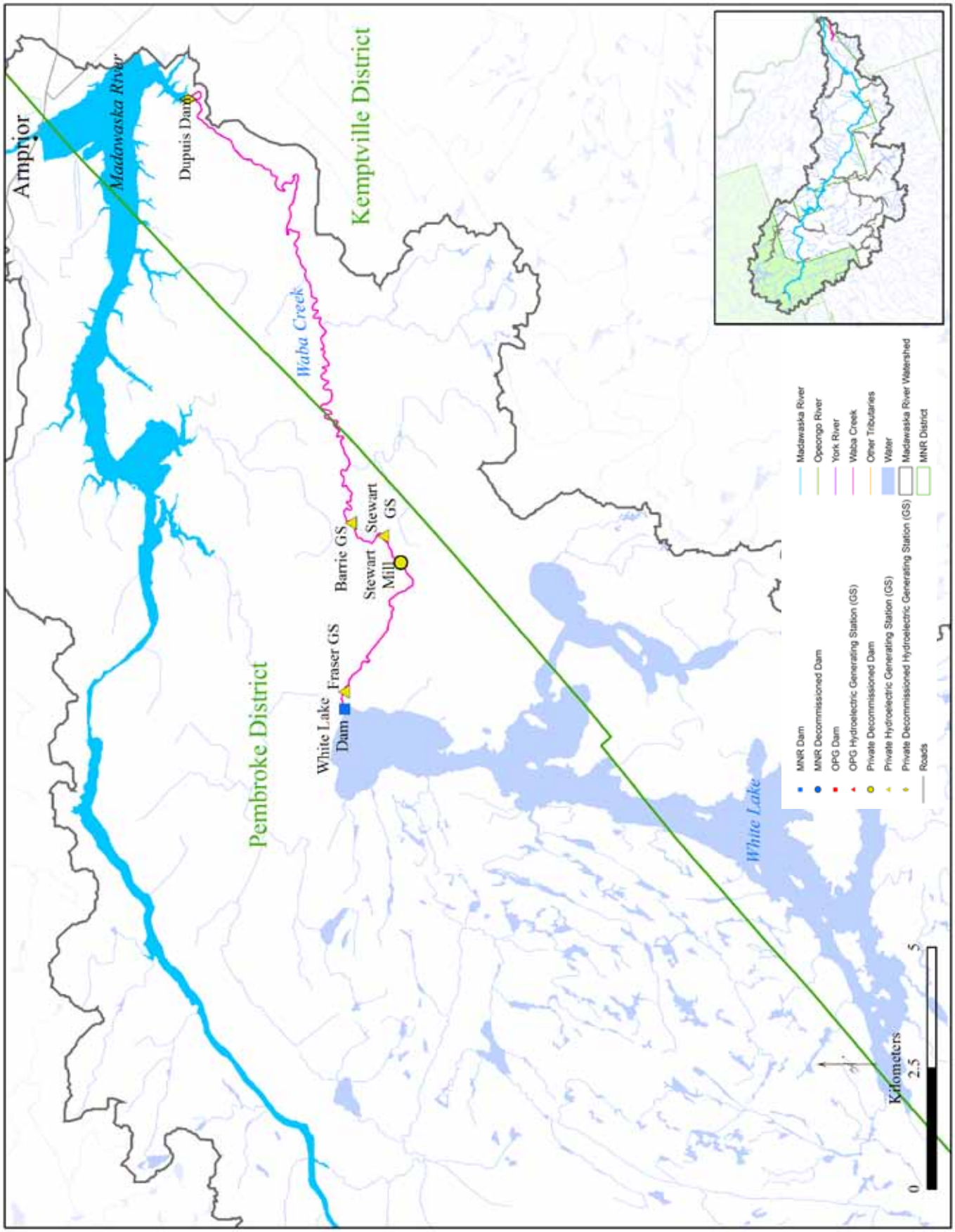


Figure 4.05: Dams on Waba Creek

4.4.2 Fraser Generating Station - Fraser Power

This small independent power station on Waba Creek is owned and operated by Fraser Power. The Fraser Dam and GS are in the Village of White Lake and are located approximately 300 m downstream of the White Lake Dam. Work to rebuild the squared timber and stone cribbed dam commenced in 1983.

The dam is 3.1 m high by 20 m long with a weir. The cement weir is 4.27 m long. The powerhouse was built in 1986 with power generation commencing in 1987 after the installation of the penstock and the double regulated Kaplan turbine. The Generating Station facility has an installed capacity of 45kW. A water level gauge is not currently installed at this site.

Fraser GS is run-of-the-river site and thus has minimal impact on levels and flows of Waba Creek. The operating regime of the dam has historically followed seasonal fluctuations of water levels in the creek. The operating regime for this station retains a dependence on seasonal flows as well as ensuring minimum flow in the creek.

4.4.3 Stewart Mill at Waba (Sawmill Dam)(Decommissioned) - Private

This facility is no longer operated. The timber crib dam is a 5.2 m high by 30 m long.

The remains of an old sawmill dam are still located on Waba Creek in the town of Waba. The concrete abutments have no influence on the levels and flows in Waba Creek.

4.4.4 Stewart Generating Station - Misty Rapids Power

The Stewart GS is owned and operated by Misty Rapids Power. The GS was built in 1990.

The dam was reconstructed in 2007 due to its deteriorating condition. The dam is 4 m high by 32 m long with four log sluices. Each log sluice is 3.2 m long. A diversion channel extends approximately 0.8 km from the weir to the powerhouse. Water is diverted through the channel and is passed through a double regulated Kaplan turbine. The GS was commissioned in 1990 with an installed capacity of 204 kW. There is no water level gauge installed at this site.

Similar to the Fraser Dam, the GS is run of the river and has virtually no storage capacity. As such, the GS is dependent on the flows in Waba Creek.

4.4.5 Barrie Generating Station - Barrie Small Hydro

The third facility on Waba Creek is owned and operated by Barrie Small Hydro Limited and is just downstream of the Misty Rapids Power powerhouse. The Barrie dam is located where the tailrace of the Misty Rapids Power powerhouse and Waba Creek come together.

The Barrie dam is 1.5 m high by 55 m long with a weir and sluice gate. The spillway is 28.3 m long and includes a 3.4 m sluice gate. The weir diverts water into a 300 metre diversion canal to a cement intake structure and steel penstock. The Barrie GS has one double regulated Kaplan turbine and automatic control system installed by Canadian Hydro Components. The plant has an installed capacity of 100 kW. A water level gauge is not currently installed at this site.

The Barrie GS has been in operation since July 1990. Similar to the other operations on Waba Creek, the GS operates as run-of-the-river as there is no headpond to maintain stored water.

4.4.6 Private Dam & Generating Station - Private

This small GS was built prior to the Arnprior development and was relocated after the Arnprior facility was built. Currently this facility is not producing waterpower; however, this may change in the future.

4.5 OTHER TRIBUTARIES

There are an additional eight dams on other tributaries that flow into the main stem of the Madawaska River (Figure 4.33). MNR owns seven of these dams, while OPG owns one. The Other tributaries include the North Madawaska River, Otter Creek, Moore Creek, Rockingham Creek, Hydes Creek, Norcan Creek, Constance Creek and Mackie Creek.

Please refer to Figure 4.06: Dams on other Tributaries.

4.5.1 Sasajewun Lake Dam - MNR Algonquin Park

The Sasajewun Lake Dam is located towards the east end of Sasajewun Lake along the North Madawaska River. Sasajewun Lake is located within Algonquin Provincial Park. The dam controls the water levels in Sasajewun Lake which is used for scientific research. The deck of the dam acts as a road bridge and is used for accessing portions of the Wildlife Research Centre. The original timber crib dam was replaced in 1950 with a concrete dam. The dam was rebuilt and modified in 1955 after a flood caused the failure of one of the earth embankments. In 1998, the earth embankments failed again as the result of a flood, and the dam was repaired once again to maintain the area of scientific interest.

The dam is 3.1 m high by 11 m long. The flow through the dam is controlled by a 3.6 m long log sluice. The primary function of the dam is to maintain reservoir levels for the Wildlife Research Station located on the lake. A water level gauge is located on the upstream face of the dam.

4.5.2 Hay Lake Dam - MNR Bancroft

The Hay Lake Dam is in Airy Township, east of Algonquin Provincial Park and is located at the north end of Lower Hay Lake. The dam is on Otter Creek which is a tributary to the Madawaska River.

Hay Lake Dam is 4.2 m high by 73 m long. Hay Lake Dam is a timber crib facility that acts as a weir. The weir is 60.7 m long with a crest elevation of 407.77 m CGD. The original dam was built in approximately 1888 by a local logging company. OPG rebuilt the dam in 1942. The Hay Lake Dam was rebuilt again in 1968. In 1992, deck boards were replaced and an angle iron was attached along the upstream edge. A water level gauge is not installed at the dam.

The dam is not operated and functions as a weir. The dam influences the water levels in Lower Hay Lake, Hay Lake, and Drizzle Lake for recreational purposes.

4.5.3 Lyell (Cross) Lake Dam - MNR Bancroft

The Lyell (Cross) Lake Dam is located in Lyell Township on the south end of Lyell Lake. The dam is on Moore Creek, which is a tributary to the Madawaska River.

Constructed in 1974, the rock-filled timber crib dam is 1.8 m high by 31 m long. The dam was not designed to be operated and acts a control weir which is 22.1 m long with a crest elevation of 439.53 m CGD. A water level gauge is not installed at this site.

The primary function of the dam is to maintain a higher water level for recreation in Lyell Lake. Prior to dam construction, cottagers struggled to navigate boats around hidden shoals. The increased lake level has eliminated this problem.

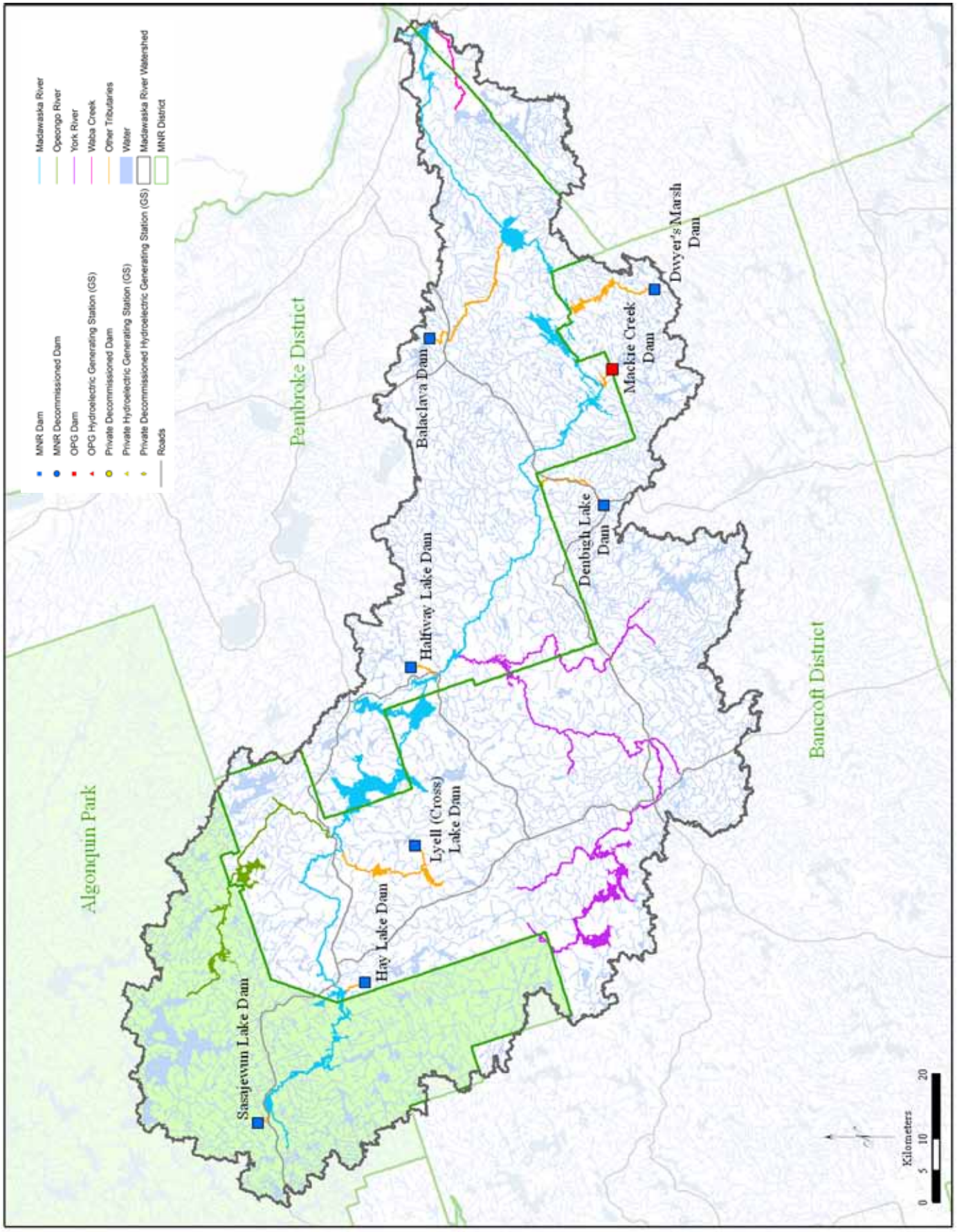


Figure 4.06: Dams on other Tributaries

4.5.4 Halfway Lake Dam - MNR Pembroke

The Halfway Lake Dam is located on Rockingham Creek, towards the south end of Halfway Lake. Rockingham Creek is a tributary to the Madawaska River and flows into the Madawaska River just downstream of Kamaniskeg Lake.

The original dam was built in 1965. In 1989 the dam wing walls were replaced, and in 1995 the new timber deck was installed over the dam.

The Halfway Lake Dam is 1.1 m high by 21 m long with three log sluices. The log sluices are 2.12 m long with a sill elevation of 313.98 m CGD.

The dam controls the water levels in Halfway Lake for recreational purposes. There is no water level gauge located at this dam.

4.5.5 Denbigh Lake Dam - MNR Bancroft

The Denbigh Lake Dam is in Denbigh Township and is located towards the north end of Denbigh Lake. The dam is on Hydes Creek which is a tributary to the Madawaska River. A road bridge is an integral part of the dam; however, it does not extend beyond the right bank of the dam.

The Ontario Department of Public Works constructed the existing dam in 1966 replacing the original rock-filled timber crib structure, which was constructed in 1908 to supply water for the flour mill operation at the site.

The Denbigh Lake Dam is 9.06 m high by 47 m long with a single log sluice. The log sluice is 4.3 m long with a sill elevation of 345.98 m (1135.1 ft) CGD.

The dam was built in order to regulate the water level on Denbigh Lake and to provide sufficient water supply for recreational and firefighting purposes. Operational considerations include recreational uses and flood control. Today, the dam controls water levels primarily for recreational purposes. An imperial water level gauge is attached to the left wing wall of the dam.

Due to the poor condition of the Denbigh Lake Dam, MNR's Class Environmental Assessment for Resource Stewardship and Facility Development projects was recently undertaken. The selected alternative is the rehabilitation of the existing dam by means of concrete repairs, safety improvements and a new emergency overflow weir. The rehabilitation work is targeted to take place within the next five years.

4.5.6 Dwyers Marsh Dam - MNR Bancroft

Dwyer's Marsh dam is in South Canonto Township and is located towards the north end of Dwyer's Marsh. The dam is on Norcan Creek, which is a tributary of the Madawaska River.

The Dwyer's Marsh Dam is a 2.5 m high by 15 m long with a single log sluice. The log sluice is 2.5 m long with a sill elevation of 257.56 m CGD. The dam was built in 1962 to better maintain the water levels in Dwyer's Marsh and to develop an artificial wetland.

This dam is not operated and functions as a fixed weir. High water levels are maintained year round for waterfowl nesting. There is no water level gauge located at this dam.

4.5.7 Balaclava Dam (Constant Lake) - MNR Pembroke

The Balaclava Dam is located towards the east outlet of Constant Lake along Constance Creek, a tributary to the Madawaska River. The original dam was built out of timber in 1854. The Balaclava Dam was rebuilt out of concrete in 1927 for lumbering and to supply power for the adjacent sawmill. The Ministry of Government Services purchased the dam in 1983 in part due to the numerous correspondences from residents on the lake who had voiced concerns over poor dam operations and low water levels. The dam also serves as a bridge carrying Scotch Bush Road.

The dam is 2.5 m high by 53 m long with three log sluices. The log sluices measure 3.2 m, 1.8 m, and 2.4 m wide respectively, with a sill elevation of 59.13 m LD.

Operational considerations include flood control, recreational uses and the downstream aquatic ecosystem. A water level gauge is attached to the buttress of the dam.

Due to the poor condition of the Balaclava dam, MNR's Class Environmental Assessment for Resource Stewardship and Facility Development projects is currently underway. The preferred alternative selected is the reconstruction of the dam and bridge. Construction was targeted for two seasons; summer 2008 and summer 2009 but has been delayed. MNR anticipates construction to begin 2012/2013 and it will be coordinated with the County of Renfrew.

4.5.8 Mackie Creek Dam - OPG

Mackie Creek Dam is located in Miller Township Concession 11 and 12, lot 40. Mackie Creek flows into Centennial Lake. Mackie Creek Dam was installed to prevent the migration of undesirable species of fish into Schooner Lake, a lake trout lake.

Mackie Creek Dam is approximately 1.3 m high by 31 m long with a weir. The weir is 27 m long. The facility is not operated and a water level gauge is not installed at the site.

5 ISSUES & RESPONSES

The issues and responses related to levels and flows identified in the Madawaska River WMP (2000), and the additional issues identified during the implementation of WMP between 2000 and 2009, are presented in this section. The issues are organized into subsections as follows:

- General issues that apply to all or most of the watershed
- Madawaska River issues
- Opeongo River issues
- York River issues
- Waba Creek issues
- Other tributary issues

Each issue has been addressed through one or more of the following actions:

- a written response
- a direct action
- identification of an information need

During the implementation of the WMP (2000) a number of new issues were identified, actions associated with specific concerns were completed or progress has been made. The source of issues in this section are differentiated by including the text "WMP (2000)" after the issue title for those issues originating from the WMP (2000), or by the text "WMP (2009)" for those that appear for the first time in this edition of the WMP. The response to and status of the action items associated with all issues have been updated as of 2009. Appendix E provides a table specifying the issues from the WMP and indicates if the response in the WMP (2009) has been modified.

The issues have been reorganized for the 2009 WMP. This has resulted in changes to the issue numbering system used in the original plan. See Appendix E to cross-reference issue numbers from the 2000 WMP with the new numbering system.

The source of the issues was also attributed to either the public or one of the agencies (OPG, MNR, Fraser Power, Misty Rapids Power, Barrie Small Hydro, BLP) involved in the review process.

5.1 GENERAL ISSUES

5.1.1 General Issue 01: Information Needs (WMP 2000)

Issue Description: *"There is a need for additional biological and ecological information in order to effectively address the issues of water level fluctuations on fish populations and aquatic ecosystems on the Madawaska River."*

Issue Source: MNR and OPG

Response:

An adaptive management approach was selected as a model to deal with the information and knowledge gaps identified during the implementation of the WMP (2000). A list of data requirements and a plan to collect and analyze the results evolved over the first eight years of the plan. Information needs were compiled by MNR and OPG including concerns identified through the public consultation process and brought forward from the SAC. The Information Needs section provides an up-to-date list of projects that are currently underway or are planned to occur. Additional work may be added or removed from the Information Needs section as priorities evolve and needs are met over the term of the plan.

Studies have been proposed or initiated as per the Information Needs section (7.0). The status of action items and date of identification/completion are included in this section. As information becomes available, the intent is to use it to make changes to water management where feasible. Formal mechanisms to deal with changes have been incorporated into the WMP as administrative, minor and major amendments.

Action 1.

Produce an Information Needs work program to collect data for 1999 and beyond. Outstanding work programs are to be prioritized and begin the process of delivering results.

Responsible Agency: All

Status: Ongoing

The identification of information needs is one of the primary results of the WMP. Over the 2000-2009 period, the information needs section was updated, studies were completed and priorities were set annually. Refer to section

7.0 for a list of completed, ongoing, and incomplete information needs.

Action 2.

Review data collection results and develop guidelines where possible to improve aquatic ecosystems. Results of completed studies are to be reported.

Responsible Agency: All

Status: Ongoing

Information Need: 7.1.1

This is being done as a part of the Section 7: Information Needs. Section 7.0 contains a list of completed and proposed information needs. As they become available and where applicable, results are incorporated during the development of the compliance framework and establishment of mandatory and conditional limits.

5.1.2 General Issue 02: Reduced Angling Opportunities (WMP 2000)

Issue Description: *"Reductions in fish populations over time have led to fewer angling opportunities, which are believed to be a product of dam construction/operation (e.g. loss of habitat, water level fluctuations adversely affecting recruitment), high angling pressure and shifts in community structure. Catch per-unit-effort has declined significantly in a number of reaches and self-reproducing populations have disappeared in some cases."*

Issue Source: Public

Response:

Angling opportunities on the Madawaska River system are abundant. With cold water lakes providing trout fishing and the cool-water river and lakes providing bass, pike and walleye fishing, the Madawaska River has a wide diversity of angling opportunities. The problem is the quality of the angling opportunity. This can be affected if fish stocks are depleted due to over-exploitation or if spawning, nursery or foraging habitat is affected by hydroelectric operations.

Over-exploitation of a lake or river section is a common occurrence on the Madawaska River, especially when applied to walleye, which is the preferred sport fish in the Madawaska River system. When walleye fishing is good in a particular lake or river section, people concentrate their efforts there until the stock is depleted. This is known as pulse fishing. Typically the anglers move on to the next site they hear is producing walleye. Anglers complain when there are no good fishing sites locally. Only a few areas on the Madawaska River have been subject to over-exploitation of the walleye fishery. Complaints have been fairly localized and OPG and MNR have been able to work with local game and fish clubs in re-establishing good fisheries. The majority of over-exploitation problems on the Madawaska River coincide with a habitat problem. When fish recruitment to a population is limited, it can be easily over-fished. MNR, OPG and local game and fish clubs have completed several walleye spawning habitat projects to improve walleye populations. These efforts have been met with some success. Recent angler reports have identified improved walleye fishing in some reaches of the river.

MNR and OPG are committed to improving angling opportunities on the Madawaska River. Projects for spawning habitat enhancement are underway and more are proposed. Fish are being stocked annually to mitigate loss of spawning habitat. Assessment and monitoring of fish stocks are ongoing. Regulations are being proposed and implemented to protect fisheries from over-exploitation. There are also many under-utilized fisheries on the Madawaska River, such as bullhead fishing in Calabogie Lake. More public education is required to promote other types of fisheries. Through this review, with fisheries at the forefront of many concerns and solutions, angling opportunities on the Madawaska River should benefit. Increases in angling quality and quantity should be an attainable result.

Action 1.

Periodic angler creel surveys are required to measure angling pressure, angler catch and harvest, and to assess regulation of a fishery. Angler Creel Surveys will be identified for specific reaches of the Madawaska River.

Responsible Agency: MNR

Status: Ongoing

Information Needs: 7.1.2

Fall Walleye Index Netting (FWIN) surveys were carried out in 1998, 1999, and 2008 on Centennial Lake.

Action 2.

Regulation of a fishery (for example slot-sizes, minimum size limits or reduced creel limits) may be proposed when a fishery has been subject to habitat alteration and/or over-exploitation.

Responsible Agency: MNR

Status: Ongoing

A slot size and one line limit for lake trout on Kamaniskeg Lake and a minimum size limit and reduced creel for walleye on Calabogie Lake and Black Donald Centennial Lake were put in place to protect these fish populations. Other regulations may be proposed as information is collected and analyzed through studies on specific reaches identified in the Information Needs section.

The proposed regulation for lake trout on Kamaniskeg Lake was enacted in 1997 and is still in place today. The regulation also includes a limit of one line only for ice fishing. The regulation for a minimum size limit and reduced creel for walleye on Calabogie, Black Donald and Centennial Lake has been in place since 1999 and 2001 respectively. Monitoring of lakes continues through the Information Needs section (7.0). All necessary actions will be taken to ensure perpetuation of fish species.

A walleye review was conducted across MNR's southern region in 2006 and on January 1st, 2008 through the fisheries regulations, MNR implemented a landscape approach to managing walleye. For all lakes in the southern region, a limit of four walleye (down from six) has been put in place. Additionally, only one of the four may be over 45 cm (18 inches) in length. However, no change was made to lakes that had special regulations in the past such as Calabogie, Black Donald and Centennial.

Action 3.

Stocking of fish in lakes that require rehabilitative stocking (e.g. Calabogie Lake) and in lakes with a "Put, Grow and Take" fishery (e.g. Bark Lake) will provide good future fisheries.

Responsible Agency: MNR

Status: Complete

Calabogie Lake rehabilitation is done. Bark Lake continues to be stocked.

Action 4.

Fish habitat enhancement or habitat creation projects through co-operation of MNR, OPG, Fish and Game Clubs or other interest groups will assist in mitigating altered habitats, and work towards improving sustainable fisheries throughout the Madawaska River system.

Responsible Agency: MNR and OPG

Status: Ongoing

These opportunities will be identified in the appropriate reach in the Information Needs Section (7.0). For example information Need 7.2.7.4 documented the need to investigate the feasibility of constructing spawning beds for walleye at Barrett Chute.

5.1.3 General Issue 03: Shoreline Erosion (WMP 2000)

Issue Description: *"Concerns about eroding shorelines have been raised throughout the watershed."*

Issue Source: Public

Response: Erosion overview

The presence of a dam or hydroelectric facilities is but one piece of a large complex set of interactions which can influence erosion. Understanding the erosion process requires knowledge of the site-specific conditions and the larger context of the overall process of erosion. What is happening at the shoreline is part of a bigger complex process that extends far beyond individual property limits and over time scales that range from days to centuries.

Rivers and lakes are open, self-regulating systems which exchange energy and matter with the surrounding environment. The following environmental factors interact to create impacts on lakes and rivers:

- climate
- geology
- land use
- basin physiography
- vegetation
- soils

Interactions between these factors, and their variation over time and location, produce the flux of water and sediments. Alterations to the external controls and their

interactions can produce adjustments with time and location of the flux of water and sediments and result in changes in the shape of a river or lake.

Erosion, accretion and movement of shoreline materials are a normal and natural phenomenon. Natural erosion forces include:

- flowing water
- flooding
- wind-induced waves
- groundwater seepage
- freeze-thaw action
- ice scour
- surface run-off
- wind

Instability of the banks of a river or shoreline is usually associated with erosion. Determining if a shoreline or river bank is stable or unstable is often very subjective. Instability can be characterized by abrupt, episodic or progressive changes in location, cross sectional geometry, gradients, or the plan-view form over a period of years or decades (Rhoads, 1995). Instability is usually associated with long continuous stretches with bare and destabilized banks, where as stability of a river or lake is characterized by vegetated banks, compacted weed-covered beds and rare instances of slope erosion (Booth and Jackson, 1997). Shoreline or bank stability does not necessarily mean that the location of the shoreline or river bank was always at and will forever be at a specified location. In fact, the literature supports the perspective that change will occur on a limited scale on even a stable river or lake.

Disturbance can be classified as direct or indirect (Simon, 1995). Direct disturbances such as the construction/operation of hydroelectric facilities or a bridge may involve the changes in form, discharge or sediment transport at a site. Indirect disturbances are changes in the conditions beyond the channel boundaries which alter the spatial or temporal variability of the water flow or sediment transport, such as the conversion of forested lands to agriculture or urban areas. Changes to the vegetative cover and or shoreline landscape can also be considered as a direct disturbance that can have an impact on the stability of the shoreline or bank.

Impact of Dam and Hydroelectric Operations

Construction of a dam can be considered a direct disturbance. One consequence of this disturbance is that water on the upstream side of the dam may relocate the shoreline to land which was not adjacent to an aquatic environment. Immediately after initial impounding, significant shoreline erosion may occur as the shoreline soils and slopes are re-shaped and altered. At some locations significant inland retreat of the shoreline may occur, while at other locations deposition of soils may create off-shore bars or shallows. Over time, the rate of erosion normally decreases as shoreline slopes evolve towards a state of stability.

Water levels and flows on a river without any dams can vary annually, seasonally or even daily due to meteorological events. Similarly, water levels and flows on a river with a dam can also vary annually, seasonally or daily due to meteorological events. The operation of dams and hydroelectric generating facilities involves obtaining a balance between many uses, including valued ecosystem components, riverine ecosystem objectives, recreation activities and power production. The operation of a dam or hydroelectric facility adds to the natural complexity because the numerous water uses usually result in flow and water level changes on an annually, seasonally, daily or even hourly timeframe.

Dams and hydroelectric facilities are often built to move water from periods of abundance to periods of limited availability. For example, during the spring, water is saved and put into storage behind a dam and then released at other times during the year when flows are lower. This movement of water changes the flux of matter and energy in the system and may have an impact on the river.

The natural variability of water can exceed the available storage capacity of a dam and cause the river to return to a natural flood level. High flows and velocities associated with a flood can have a significant impact on shoreline and riverbank erosion, even if the events are only of short duration. Consequently, even within what may be described as a “regulated river system”, natural forces may govern flow and impact significantly on the nature, location and extent of erosion.

Rivers

All six environmental controls can change with time and may result in changes to the form of a river. Changes to the energy flux, to the material flux, or to the surrounding environment and internal storages within a river, can manifest themselves in a number of interconnected ways. The complexity of the interconnected ways makes it difficult to estimate how a river will adjust to various types and magnitudes of change.

A river can respond to disturbances by adjustments of channel cross-sectional form, bed configuration, plan-view form and slope of the channel bed (Knighton, 1984). Changes of cross-sectional form occur over a period of years while changes of bed configuration occur over decades (Knighton, 1984). Changes of plan-view geometry and channel slope could be expected over a period of centuries or longer (Knighton, 1984). In some cases a very large disturbance can accelerate the rate of change. It is difficult to conclude that all changes that occur today along the river are attributed to the water flow and levels that were experienced today, yesterday or even last year, because adjustments of the channel form can take place over centuries.

Lakes

Lakes often possess many significantly different shoreline conditions resulting from variations in shoreline geomorphology, exposure, vegetation cover and development. Erosion caused by wave action or by large storm events may vary significantly from location to location along a lake shoreline. Water level fluctuations may also influence the rate and nature of erosion occurring along a lake shoreline. It is difficult to determine if the erosion that is occurring at a particular location is solely the result of natural processes, is the direct result of regulated flow and water level regimes, or is the product of the interaction of natural and altered processes. It must also be stressed that interactions of the external environmental controls also change and can have an impacts on surface runoff and erosion. The complexity of interactions of internal and external factors makes it very difficult to determine quantitatively whether there might have been more or less erosion occurring at a specific location, with or without a dam.

As waters flow into a reservoir, flow velocities generally decrease and suspended material will be deposited on the reservoir bed. After passing through the dam, because of the increased velocities and decreased suspended load, increased scour of the river banks and bed may occur immediately downstream of the dam. This material will ultimately be transported downstream and at some downstream location, because of reduced flow velocities, this material will be deposited to create shoreline and/or mid-channel bars or shallows. Such deposits may ultimately have an impact on the channel configuration and alignment, the nature of channel flows and upon the extent and location of river bank erosion.

The construction and operation of a dam or hydroelectric facilities may alter the flux of energy and matter and have an impact on the natural processes of erosion and accretion. When a hydroelectric development or other change occurs, there may be a period of readjustment when erosion and/or accretion may be more or less prevalent. Both natural and human factors can influence the nature, rate and extent of erosion and/or accretion occurring along a river or lake. The degree to which human and natural factors contributes to the overall erosion process is very difficult to quantify.

OPG contact Information

Concerns about erosion related complaints and issues related to a reach within the OPG portion of the Madawaska River should be directed to First Line Manager Operating Ottawa\Madawaska at (613) 432-8878, ext. 3315.

Erosion-related complaints and issues related to any other dam/facility should be directed to the appropriate agency that operates the dam/facility.

Online resources

The Living by the Water Project has created a useful reference book that contains two sections that deal with the shoreline. The Shoreline Landscaping and Shoreline Erosion sections of the book provide useful information on the subject. The Living by Water Project website has some useful online information as well as an Ontario-specific Handbook that can be purchased. The Living by the Water Project web site is:

www.livingbywater.ca/main.html

Action 1.

MNR and OPG will conduct erosion workshops to assist shoreline dwellers with potential solutions.

Responsible Agency: MNR and OPG

Status: Complete

An erosion workshop took place in Eganville May 13, 2002. Advertisements were placed in local newspapers and interested individuals were invited to attend.

In 2003, Renfrew Power Generation Inc. held an erosion seminar that was made available to all Madawaska River residents.

Additional workshops will be held provided requests are received from a reasonable number of individuals.

Action 2.

The Erosion Working Group Chair will provide an overview of the program to the PAC.

Responsible Agency: OPG

Status: Complete

The Erosion Working Group no longer exists. Information was presented at the SAC meeting on October 28, 1999.

5.1.4 General Issue 04: Economic Contribution of Tourism (WMP 2000)

Issue Description: *"There is a need to determine the contributions made to tourism from fish, wildlife, recreation and water-related activities on the Madawaska River."*

Issue Source: Public

Response: An assessment of economic activity, including tourism, on the main stem of the Madawaska River was completed in 1999. This study provides baseline information of on the commercial activities on other users of the shared resource and provides an indicator of the sensitivity of commercial operations to changes in water levels and flows.

MNR conducted a Visitor's Survey on the Madawaska River during the summer of 1997.

Action 1.

A consultant was contracted to perform the study. The report is complete and is available.

Responsible Agency: OPG

Status: Complete

Information Need: 7.1.3

The report was published in July 1999.

Refer to section 11.

Hagler, Bailly (1999).

5.1.5 General Issue 05: Ontario Power Generation's Right to Arbitrarily Drawdown Reservoirs (WMP 2000)

Issue Description: *"There is a concern about Ontario Power Generation's ability to drawdown the river reservoirs arbitrarily, with permission from Environment Canada."*

Issue Source: Public

Response: OPG does not operate in an arbitrary manner. Operation of OPG facilities on the Madawaska River is subject to applicable provincial and federal legislation. OPG has a long-standing practice of voluntarily adopting water level and flow target limits to accommodate other uses when proposals or requests have been put forward.

At the federal level, OPG operations must comply with the relevant sections of Department of Fisheries and Oceans (DFO) "Fisheries Act".

The following provincial legislation applies to OPG operations:

- Lakes and River Improvement Act (LRIA)
- Public Lands Act
- Environmental Assessment Act

MNR is responsible for water management planning in Ontario and has the authority under the LRIA to order the development of a water management plan. MNR also has the authority under the LRIA to give direction on flows and levels. The focus of water management plans has been on watercourses with hydroelectric facilities. Facilities on international and provincial borders are exempt from this requirement. Plans can be amended to adhere to certain guidelines to make sure they are in compliance with the LRIA and the WMPG (2002). Water Management Plans become legally binding documents upon approval. MNR issued the Order to complete the Madawaska WMP to OPG on July 4, 2005.

Limits specified in the WMP (2009) are now legally binding and must be adhered to under the specified conditions.

Ontario's Public Lands Act authorizes the disposition of Crown land for a variety of purposes by Sale, Lease or Licence of Occupation and the granting of water powers. Under the Act, MNR has authorized OPG flooding of

Crown land to create water storage through Licences of Occupation. Storage facilities that have hydroelectric generating capability are authorized under Water Power Lease Agreements or a Water Power Lease.

The Ontario Ministry of the Environment administers the Environmental Assessment Act. The Act requires OPG to prepare an assessment of the potential environmental impact of a project. MNR and OPG dams on the Madawaska River were constructed prior to the Act coming into force in 1976.

Action 1.

Update WMP (2000) to the new WMP standards.

Responsible Agency: MNR and OPG

Status: Complete

This document incorporates the necessary requirements for an approved water management plan under the Lakes and Rivers Improvement Act. It has been prepared in accordance with the WMPG (2002).

5.1.6 General Issue 06: What Effect Will Privatization have on Water Management on the Madawaska River (WMP 2000)

Issue Description: *"There is a public concern that the present water management on the Madawaska, and the changes proposed during the review will not be carried forward to new owners, should OPG be privatized and hydroelectric assets sold."*

Issue Source: Public

Response: There are no plans to privatize OPG assets on the Madawaska River. OPG is currently expanding and enhancing its hydroelectric facilities on some rivers in Ontario. Under the LRIA, MNR has the authority to ensure that the terms of a WMPs are followed. WMPs are legally binding and would apply to any new operator/owner in the event of any transfer of ownership or responsibility.

Action 1.

MNR and representatives of Ontario's water power industry, including OPG, carried out a review of government policies on water management planning, including dam operations. The bipartisan "task force" reported its findings in 1999.

Responsible Agency: MNR and OPG

Status: Complete

It was recognized that the implications of this issue are far-reaching and are of a provincial nature, and are beyond the terms of reference for the review. As a result of the completion of the Madawaska River WMP (2000), legislation has been changed to require dam owners to prepare water management plans for all rivers with waterpower production. The WMPG (2002) have guided the preparation of the updated Madawaska River WMP.

Its recommendations reinforced the government and industry commitment on moving toward "self-regulation" of the industry under stringent standards set by the government in consultation with other stakeholders within the watersheds affected.

Responsible Agency: MNR and OPG

Status: Complete

5.1.7 General Issue 07: There is a Need to Create Greater Public Understanding of Why and How the River is Operated in the Manner that it is (WMP 2000)

Issue Description: *"There is insufficient public understanding of why and how the stations are operated the way they are, and how the river's reaches are related. The river environment has been altered greatly since the first dam was constructed. The dams act as barriers to the movement of fish species. OPG operates peaking generating stations, which means they discharge water significantly less than 24 hours in a day. Summer operation is generally restricted to a few hours each day."*

Issue Source: Public

Response: MNR and OPG recognized the need to create a greater public understanding of how and why the river is operated. The Madawaska River WMP is part of a process to improve the public's understanding of how water is managed in the Madawaska River Watershed.

The communication Strategy for the Madawaska River includes:

- Establishment of the Madawaska River SAC
- Posting SAC Meeting Minutes on the OPG Website
- Posting the WMP (2000) on the OPG Website
- Posting the WMP (2009) on the OPG Website
- Posting water level and flow information on the OPG website
- Annual Stakeholder meetings to review annual operations

Action 1.

An action plan will be developed for providing information to the public in the future. A part of the action plan will include annual stakeholder meetings which OPG hosts.

Responsible Agency: MNR and OPG

Status: Ongoing

OPG started annual stakeholder meetings on the Madawaska River in 1997. Annual stakeholder meetings were established to provide a formal setting for exchanging information about the operation of the river with members of the public. The stakeholder meetings were not advertised in any formal way. Between 2000 and 2004 the SAC members made a number of requests to advertise the stakeholder meetings in local newspapers. Starting in 2005 the OPG stakeholder meetings on the Madawaska were open to the public and paid advertisements appeared in local newspapers. Annual stakeholder meetings, hosted by OPG, will continue as a part of the action plan to keep the public informed.

In addition, the SAC requested that the 2003 annual report to be modified to include background information about the operational flow and level graphs at OPG facilities.

OPG will continue to provide an annual summary of operations at stakeholder meetings as well as a written report.

Action 2.

OPG is committed to maintaining the Internet website that will be available in the summer of 1999.

Responsible Agency: OPG

Status: Complete

In 1999 OPG started the weekly or twice-weekly updates of the flow and level webpage. Requests from the SAC to report more frequently on the levels and flows have been received over the past five years. OPG is working on a web update process that will allow level and flow updates at least once per day at sites where continuous readings are currently obtained.

Action 3.

The website will include a summary of the Madawaska WMP, with directions to the complete document for those interested in acquiring a copy.

Responsible Agency: OPG

Status: Complete

Regular water level and flow web updates can be obtained at the following web address:

http://www.opg.com/safety/water/river/madawaska/madriver.pdf

Minutes of the Madawaska SAC and the WMP (2000) as well as WMP (2009) can be found at the following web address:

http://www.opg.com/community/activities/ottawa/madawaska.asp

5.1.8 General Issue 08: Mechanism for Long-Term Public Involvement in Water Management on the River (WMP 2000)

Issue Description: *"There is a need to ensure that the public awareness which is generated as a result of the water management review is maintained, and to provide on-going opportunities for the public to give advice to the agencies on the best ways to address problems and issues."*

Issue Source: Public

Response: MNR and OPG agree on the principle of public participation. Public involvement and participation are key elements in the development of the WMP. Providing long-term opportunities for broad public involvement in the river's management is a stated objective.

A PAC was established to assist and support the agencies during the development of the WMP (2000). The

PAC assisted in obtaining a broad base of information from the general public, and other organizations that have an interest in the management of the river. The SAC was established to monitor the implementation of the WMP (2000) and identify issues that require attention. The SAC will continue to provide public input into the WMP process.

Concerns and issues were documented in the WMP (2000). The tracking of issues and identification of new issues continued through the SAC and were documented in the Madawaska River WMP five-year Report (2005) as well as the WMP (2009) to ensure continuity and completeness for future reference.

Action 1.

The website developed for the previous section will have the capability for the public to provide comments on-line. There will be a summary of the Madawaska WMP along with directions to the complete document for those interested.

Responsible Agency: OPG

Status: Complete

The WMP was available on the website from its approval date until it was replaced by this document, the Madawaska River WMP (2009). Comments or concerns can be sent by regular post, email or phone. On-line comments are handled by creating an email message.

Action 2.

Install and make the public aware of a toll-free phone line for input.

Responsible Agency: OPG

Status: Complete

In 2004, OPG added a toll free number (1-888-895-1592 extension 3395) so that members of the public can contact OPG about water level and flow issues on the Madawaska or Ottawa Rivers.

Action 3.

Form a Standing Advisory Committee for water management on the Madawaska River with Terms of Reference to define activities.

Responsible Agency: MNR and OPG

Status: Complete

In August of 2000, a SAC was formed to monitor the implementation of the WMP. Membership of the committee has changed since its formation as members have resigned and new members have been recruited. All approved minutes of the SAC meetings are posted on the website.

Action 4.

OPG and MNR will each develop a process to log communications from the public. It was the intent to establish a single database but legislation restrictions, standards and requirements specific to each agency make this prohibitive.

Responsible Agency: MNR and OPG

Status: Ongoing

OPG and MNR will provide a written report summarizing public issues/concerns as they relate to levels and flows, for review at each SAC meeting, and would be included on the agenda for each meeting as a formal item. OPG is working towards an improved public issues reporting process.

5.1.9 General Issue 09: Effect of Water Level Fluctuations on Shoreline Property Owners (WMP 2000)

Issue Description: *"Water level fluctuations can create problems for people who have structures below the high water mark or near shorelines. Ice and elevated water levels can damage tourist operators' and cottagers' docks, boat houses and associated infrastructure, create floating debris, reduce the size of beaches, etc. There are site-specific challenges in determining the appropriate limits to development. No flood risk mapping has been prepared for any portion of the river."*

Issue Source: Public

Response: Water level fluctuations are addressed in various reaches as site-specific issues. Most water level complaints are received during the summer period. The major reservoirs operated by OPG have summer ranges that restrict water fluctuations during the prime tourist season, from the May long weekend to Thanksgiving weekend.

A summary of reach specific issues related to water level fluctuations are covered in other sections as outlined below.

Reach	Reach Name	Issue #
1	Madawaska River Reach	5.2.1.1
1	Madawaska River Reach	5.2.1.2
2	Bark Lake	5.2.2.2
2	Bark Lake	5.2.2.4
2	Bark Lake	5.2.2.8
3	Kamaniskeg Lake	5.2.3.2
3	Kamaniskeg Lake	5.2.3.3
5	Mountain Chute	5.2.5.1
5	Mountain Chute	5.2.5.2
7	Calabogie	5.2.7.1
8	Stewartville	5.2.8.1
8	Stewartville	5.2.8.2

Flood risk mapping is available from MNR for the Griffith area and for Arnprior. The provision of development limits and additional flood-risk mapping is outside the scope of the WMP.

Ice damage occurs periodically on rivers and lakes. OPG does not manage water levels to protect permanent structures along rivers and lake shorelines during the ice season. Removable floating dock systems are recommended to avoid ice damage associated with fixed docks.

Action 1.

MNR will hold a seminar for interested shoreline property owners on floating docks and recommended designs.

Responsible Agency: MNR

Status: Complete

Information on floating docks was included as part of the Erosion Workshop held May 11, 2002.

5.1.10 General Issue 10: Generating Station/Dam Portage Routes (WMP 2000)

Issue Description: *"At some if not all generating stations/ dams, there are safety booms, shoreline signs and fencing both upstream and downstream from these sites that establish zones prohibiting public entry. These effectively prevent boat travel between river reaches."*

Issue Source: Public

Response: OPG produced a brochure in 1982 showing portage routes on the Madawaska River. The river reaches were examined and routes re-established around OPG facilities as part of OPG concerns about public safety. Safety booms, fencing and additional signs were put in place. A revised brochure showing the portage routes around each generating and storage facility was published.

Action 1.

OPG will open portage routes (subject to satisfying public safety concerns) with appropriate signs around facilities it controls on the Madawaska River. A brochure will be completed that identifies locations and gives clear directions. MNR will help with clearing the portage routes.

Responsible Agency: MNR and OPG

Status: Complete

OPG agreed to establish portage routes around the seven facilities on the Madawaska River. Public safety features were enhanced and some portage routes were re-established on adjacent properties. The three upstream portages routes around Bark Lake Dam, Kamaniskeg Lake Dam and Mountain Chute GS were completed in August 2003. The portage route around Arnprior makes use of public roads to connect to the Ottawa River. All seven portage routes were officially opened on May 24, 2004.

The brochure showing the portage routes on the Madawaska River can be obtained from the following web site:

http://www.opg.com/pdf/canoebrochure.pdf

Action 2.

OPG will facilitate access to portage routes on adjacent private lands.

Responsible Agency: OPG

Status: Complete

All seven portage routes were officially opened on May 24, 2004.

5.1.11 General Issue 11: Access to Water Level Forecasts (WMP 2000)

Issue Description: *"Inflow forecasting is done by OPG on a continuous basis for daily, weekly and longer periods, to manage water levels in the reaches of the Madawaska River to within specified limits. River users do not have access to this elevation information for the purposes of planning their activities along the river."*

Issue Source: Public

Response: OPG has agreed in principle to make forecasts of water level and flow information available to the general public. The information can be made available by a toll-free number for phone access, combined with an Internet website. The website is updated weekly and the toll-free number provides access to an OPG employee who can provide level and flow information as well as answer other questions about operations on the Madawaska River. Originally, it was envisioned that paper copies would be posted at strategic locations (for example municipal offices, libraries and the Griffith General Store). However, it was decided that a paper copy distribution was not necessary because of the widespread availability of Internet access and the implementation of a toll-free number. Water level forecast information is available in a usable format.

Action 1.

The OPG website and toll free phone access will be made available for water level and flow forecasts in late spring 2000.

Responsible Agency: OPG

Status: Complete

Regular water level and flow web updates can be obtained at the following web address:

http://www.opg.com/safety/water/river/madawaska/madriver.pdf

The toll-free number is 1-888-895-1592 extension 3395

Regular water level and flow web updates can be obtained at the following web address:

http://www.opg.com/safety/water/river/madawaska/madriver.pdf

Action 2.

The distribution and posting of paper copies of water level forecasts need to be developed.

Responsible Agency: OPG

Status: Complete

It was decided that a paper copy distribution was not necessary because of the widespread availability of Internet access and the implementation of a toll-free number.

5.1.12 General Issue 12: Water Level Recording relative to Peak River Use by People (WMP 2000)

Issue Description: *"Water level elevations are collected daily at midnight. This does not correspond with the peak period of usage (i.e. mid-day) of the river by other users."*

Issue Source: Public

Response: OPG official water levels records have one reading to reflect the operation during a given day. Water levels are monitored throughout the day and the water level data stored is usually hour 24 and daily average value. OPG uses the midnight water levels to calculate inflows on a daily basis to monitor supply conditions. This format coincides with OPG process of producing an operational schedule for the hydroelectric stations on a daily basis. The compliance section of the WMP specifies the more rigorous data collection requirements and file retention periods.

Action 1.

OPG is required to implement the data collection requirements as specified in Table 9.02 and follow the file retention requirements specified in section 9.1.

Responsible Agency: OPG

Status: Ongoing

In 1999 OPG started the weekly or twice-weekly updates of the flow and level webpage. Requests from the SAC to report more frequently on the levels and flows have been received. OPG is expecting to have a web update process that will allow level and flow updates at least once per day at sites where continuous readings are currently obtained.

5.1.13 General Issue 13: Requests for Flows for Various Uses/Users (WMP 2000)

Issue Description: *"The method of balancing the needs of upstream and downstream users, while providing specific flow requests and maintaining a measure of operating flexibility, need to be reviewed. There is a move towards the principle of "user pay" for commercial users, to recover costs."*

Issue Source: Public

Response: The balancing process involves negotiating a compromise acceptable to both affected parties. Upstream and downstream users must understand the impacts of flow request on one another. Any compromise must take into account the potential impacts on the entire watershed, not just the immediately affected area, so that other users are not adversely impacted. OPG will seek to recover costs and/or any loss of revenue from a commercial operation to provide flows. Any additional request must meet the existing level and flow limits.

Action 1.

Issues will be resolved as they develop.

Responsible Agency: OPG

Status: Complete

No issues have been raised.

5.1.14 General Issue 14: Water Management Models (WMP 2000)

Issue Description: *"Existing computer models used by OPG do not explicitly address environmental concerns."*

Issue Source: Public

Response: OPG uses a variety of methods to analyze the impact of operations. The analysis of an issue usually does not directly model the entire physical/biological process of an environmental concern. Instead, the analysis of an environmental concern is usually carried out against potential water level or flow targets as they are the direct result of operating the facility.

For instance, fishery habitat impact data has been collected from flow tests to determine a range of suitable flow conditions from direct observations under a variety of conditions. The selection of the WMP limits involved reviewing the potential flow conditions. An assessment of the impact that the potential flows had on water levels of flows of various reaches were carried out. Computer simulations were carried out on reservoir operations to determine the risk of various options on fulfilling other level and flow requirements. The simulation was used to aid in selection of an appropriate solution. The solution and any special conditions were adopted. OPG then manages the levels and flows to be compliant with the established requirements.

Models and techniques continue to evolve. However, there is no model that is capable of modelling all aspects of the environment. Appropriate models/techniques will be utilized to assess an issue and the required level and flow restrictions will be evaluated.

Action 1.

Water management models will incorporate new operating criteria as required.

Responsible Agency: MNR and OPG

Status: Complete

Appropriate models and techniques will be utilized to evaluate the different level and flow regimes to deal with various environmental aspects.

5.1.15 General Issue 15: Decision Making Information (WMP 2000)

Issue Description: *"What data/information on social, economic, cultural, recreational uses (i.e. people's preferences for management) of the river is required to ensure that a balance is achieved among various uses/ interests when making water management decisions."*

Issue Source: Public

Response: An economic activity study of the Madawaska River and a visitor survey were carried out to help evaluate tradeoffs regarding flows and levels between affected users and regions along the river. Neither a formal cost/benefit nor a weighting scheme of options was utilized during the creation of the WMP (2000). The limits adopted in the WMP (2000) were based on the long evolution of voluntary constraints and the information collected during the review

process. Limits in the WMP (2009) are now part of the regulatory requirements and include some modifications to deal with a number of issues that emerged since the WMP (2000) was published.

Action 1.

The economic activity study will be completed in March 1999.

Responsible Agency: OPG

Status: Complete

Information Need: 7.1.3

The report was published in July 1999.

Refer to section 11.

Hagler, Bailly (1999).

Action 2.

Conduct additional surveys periodically to measure activity.

Responsible Agency: MNR and OPG

Status: Ongoing

Information Need: 7.1.4

5.1.16 General Issue 16: Dam Operating Documents (WMP 2000)

Issue Description: *"Current operating documents contain site-specific user and species-requirements, established in response to specific concerns. These documents need to incorporate principles of managing water for sustainability."*

Issue Source: Public

Response: The concept of sustainability was applied during the water management review to develop a WMP. The WMP identifies operating criteria OPG follows at its facilities to achieve the objective of sustainability.

The operating constraints in Chapter 9 are legally binding requirements for OPG and other operators.

For example, to enhance pike spawning habitat in the Springtown Marsh the level is required to be at or above 144.00 m at Stewartville G.S. The instruction does not discuss sustainability, but the result of following the level criteria will improve the resource and achieve the principle of sustainability.

Action 1.

No action is planned.

5.1.17 General Issue 17: Protocol for Inter-Agency Communications during Spring Freshet and Walleye Spawning/Incubation (WMP 2000)

Issue Description: *"Notification by MNR staff (i.e. Algonquin Provincial Park and Bancroft District) of flow changes to OPG staff (Toronto and Chenaux) is important to help reduce flooding in the spring during high water years. Frequent communication between the organizations (MNR Pembroke and OPG Toronto/Chenaux) is needed during walleye spawning and egg incubation."*

Issue Source: Public

Response: Frequent discussion between OPG and MNR staff at Whitney, Algonquin Provincial Park and Bancroft who control the headwater lakes take place during spring freshet. Conversations are held to review operating strategies and coordinate flows and levels in the Madawaska River as needed.

OPG must follow the constraints listed in Chapter 9. Some the constraints deal specifically with walleye spawn and incubation requirements. MNR is in regular contact with Walleye Watch participants and provides notification to OPG on the status of the spawn/incubation.

Action 1.

OPG will draft an operating procedure describing requirement and contact names/phone numbers for MNR/OPG communication during freshet.

Responsible Agency: OPG

Status: Complete

Information Need: 7.1.5

OPG requirements during the spawn and incubation period are identified in Chapter 9.

OPG/MNR exchange information during freshet as the situation evolves. Members of the Walleye Watch carry out regular inspections and MNR utilizes this information to determine the start and end of the spawning and incubation period.

Action 2.

OPG will draft an updated operating procedure for the walleye spawn and forward it to MNR, including the Walleye Watch regular telephone calls.

Responsible Agency: OPG

Status: Complete

OPG requirements during the spawn and incubation period are identified in Chapter 9. MNR identifies the start of the spawn, start of the incubation period and end of the incubation period by facility. MNR will continue to identify the dates and OPG will continue to fulfill the requirements specified in Chapter 9.

Action 3.

MNR will notify the public of opportunities to participate in the Walleye Watch and other related projects.

Responsible Agency: MNR

Status: Ongoing

MNR goes to local fish and game clubs to recruit participants. Some training is required, so it is not practical to include the general public in these activities. It is also important to maintain a degree of confidentiality with regard to spawning locations. All known sites have Walleye Watch participants.

Action 4.

Results of the Walleye Watches are to be reported and made available to the public on request. A method of providing the information is to be developed.

Responsible Agency: MNR

Status: Ongoing

This information can be sensitive with regard to accurately pinpointing spawning beds. In the interest of reducing the possibility of those individuals prone to exploiting our natural resources through activities such as poaching, the information is generally shared with fish and game club members. This is more of a status report on the state of the resource. No method of providing the information on a broader scale to the public has been developed. This is both a resource management and enforcement decision. Its primary value is to fisheries managers. If requested, the SAC will be provided with a report on the outcome of the Walleye Watch after the fact.

Action 5.

The dam operating documents will be updated periodically to reflect new operating criteria that reflect the concept of applying fisheries sustainability.

Responsible Agency: OPG

Status: Ongoing

The WMP will be updated as required using the amendment process described in section 1.9.

5.1.18 General Issue 18: Managing Water Levels to Within Specified Operating Limits in Extreme Wet or Dry Weather Years (WMP 2000)

Issue Description: *"Extreme wet and dry years present additional challenges to water managers balancing citizenship and environmental commitments. Achieving and maintaining a balance in water supply among a range of uses/interests on the river can be difficult, given the recognition that supplies (inflows) are continually changing."*

Issue Source: Public

Response: Some level and flow constraints contain conditional statements that allow for modified operations when flows are above or below specified thresholds. Watershed conditions in terms of flow and level are monitored continuously by OPG to determine changes in water supply. Weather forecasts combined with computer simulation models allow risk assessments to be calculated under a variety of operating scenarios from Bark Lake to Arnprior GS. The process is repeated as often as necessary. Operating strategies are changed as inflow conditions change.

During freshet, the Madawaska River is managed in conjunction with the Ottawa River for flow control. The additional resources of Hydro-Québec and the Ottawa River Regulating Committee for inflow forecasting are used to guide operations.

Action 1.

OPG is reviewing its water management tools to identify areas that can be improved. A development program to build an improved computer-based water management decision support system is underway.

Responsible Agency: OPG

Status: Complete

Issue addressed in Madawaska River Water Management Review document. The Bark Lake Study has been completed and monitoring is ongoing. Tools and techniques used by OPG to assess risk and forecast flows continue to evolve.

5.1.19 General Issue 19: Maximum and Minimum Water Level Elevation of OPG Controlled Reservoirs (WMP 2000)

Issue Description: *"Maximum elevations for flooding are established in licenses of occupation issued by MNR. The minimums have been established by OPG and modified from time-to-time based upon responses to various concerns raised by MNR and the public."*

Issue Source: Public

Response: The water level ranges for OPG facilities are specified in section 9.2. Limits at OPG facilities that are specified in Chapter 9 are legally enforceable limits. The absolute maximum level is usually at or below the limit defined in the Licence of Occupation or Water Power Lease Agreements. Within the operating range, some locations have defined flood storage and energy emergency storage. The applicable limit varies seasonally and some limits require specified conditions to be meet. Limits are defined either by the equipment/structure requirements and or citizenship or environmental requirements.

Action 1.

Defining, confirming and/or further refinement of limits and constraints is a product of the water management review.

Responsible Agency: All

Status: Complete

Dam and facility limits are specified in Chapter 9. The process to amend or modify any flow or level limit is specified in section 1.9.

5.1.20 General Issue 20: Mechanism for Addressing Destruction of Fish Habitat (WMP 2000)

Issue Description: *"There is a need to ensure that the water management plan complies with the requirements of the Department of Fisheries and Oceans. Section 35 of the Fisheries Act requires that authorization from the Minister of Fisheries and Oceans be obtained prior to undertaking any work or action that would result in the harmful alteration, disruption or destruction of fish habitat."*

Issue Source: Public

Response: Section 35 of the federal Fisheries Act addresses the destruction of fish habitat. Essentially, the section says it is illegal to destroy fish habitat unless authorized by the Minister of Fisheries and Oceans. Section 35 (1) indicates that "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat." Section 35 (2) indicates that "no person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act." Other relevant and applicable sections of the Fisheries Act include sections 20, and 21, which deal with the need for safe fish passage; section 22, which deals with minimum flow requirements; section 27, protection of the fishways; section 30, fish guards and screens; section 32, destruction of fish by other means than fishing, and section 36, deleterious substances.

The Act is administered through DFO's Policy for the Management of Fish Habitat. The objective of the Policy is to achieve a Net Gain of habitat for Canada's fisheries users in a manner that will be of benefit to all users.

It is also a blueprint for a common sense, cooperative approach between the private sector and various levels of government. DFO recognizes that the policy would have potential impact on regional development, industrial and other resource sectors, and public projects. DFO pledged to consider the interests of other resource users while striving to maintain and improve the productive capacity of fish habitats.

The guiding principle of the policy is "no net loss of the productive capacity of habitats." DFO applies this principal to proposed works and undertakings. Recognizing the difficulty in evaluating and quantifying impacts from existing facilities, and the potential for economic disruption, DFO has not applied the principle retroactively to approved or completed projects. OPG has adopted limits in water management to mitigate the effects from existing projects on fish habitat with the assistance of MNR.

OPG has not requested Fisheries Act authorization for the destruction of fish habitat from existing operations. DFO has not yet developed such a process for existing operations in Canada. OPG is committed to sustainable development including the protection of fish and fish habitat. The Madawaska River Water Management Review has been developed in partnership with MNR as one approach to achieve the objectives of Fish Habitat Policy.

Action 1.

DFO will review the draft document for consistency with the Policy for the Management of Fish Habitat.

Responsible Agency: DFO

Status: Complete

DFO was involved in the 2000 and 2009 review process but cannot "sign off" on the WMP. The lack of a DFO signature on the WMP is not related to the support or lack of support of the WMP and the limits that have been developed. The absence of a DFO signature on the WMP is based on general DFO policy and is not specific to the Madawaska WMP.

5.1.21 General Issue 21: Flow and Water Level Effects on Non-Aquatic Wildlife (WMP 2000)

Issue Description: *"The focus seems to be on aquatic life. Has any research been done on the effects of water level fluctuations on other wildlife species (i.e. - poor fish population's effect on species which prey on fish)?"*

Issue Source: Public

Response: Biologists usually discriminate between aquatic and terrestrial communities. The aquatic community may contain many non-fish organisms such as invertebrates (bugs), amphibians (frogs), reptiles (turtles), birds (ducks, herons) and mammals (muskrat, mink). Aquatic species are dependent on aquatic habitats for their existence. Terrestrial species may also utilize resources from aquatic habitats and communities but are usually not dependent on them.

While many of the concerns in the review deal with game fish, concerns about the effects of flow management on other fish species, aquatic plants, invertebrates, amphibians, turtles, aquatic birds and waterfowl, and aquatic mammals such as muskrat, beaver, mink and other creatures, are addressed. Issues have already been raised about non-fish components of the aquatic community.

OPG has previously introduced constraints on operations to protect many of them (for example - Conroy's Marsh winter and spring management). Much of the interest has been in species with resource value (e.g. furbearers, ducks, wild rice). There is a proposal to look at broader issues such as general wetland ecology. Two studies have already been initiated on wetlands in the system.

The river may also be important to terrestrial species that utilize aquatic resources (e.g. moose, eagle, raccoon). Little consideration has been given to these species to date. By protecting fish and other aquatic species, terrestrial species should also be protected.

Action 1.

MNR/OPG will conduct a literature search to determine if any research has been done on this topic.

Responsible Agency: MNR

Status: Complete

Information Need: 7.1.6

This search, including the Internet, found no listing of information specific to the impact of water levels on non-aquatic species. However, it was determined that, by doing a search of individual non-aquatic species, information relating to those species and the effects of water level fluctuations, could be found for some species. To provide a comprehensive, complete list of all literature on non-aquatic species would not be meaningful to this initiative.

A literature review was completed in 2002. However, there was not a significant amount of information directly related to this subject.

5.1.22 General Issue 22: Stewardship and Volunteer Opportunities (WMP 2000)

Issue Description: *"Members of the Public Advisory Committee would like to be made aware of any stewardship or volunteer opportunities which may arise on the Madawaska River."*

Issue Source: Public

Response: A list of contact names and organizations was provided in the WMP (2000). Anyone interested in volunteer opportunities should contact MNR district offices in Pembroke or Bancroft.

The two action items from the WMP 2000 is to provide Renfrew County Stewardship Council membership lists and Community Fisheries and Wildlife Involvement Program (CFWIP) information were completed and are no longer applicable.

Action 1.

No action is planned.

5.1.23 General Issue 23: Alternative Hydro Projects (WMP 2000)

Issue Description: *"Alternative hydro projects should be researched, such as small generators that do not need to span an entire river and are used in some locations.*

There are several examples being used in the United States. These have a less detrimental effect on the environment and can service a small community (500 - 1000 population) on an independent grid."

Issue Source: Public

Response: The subject is beyond the scope of this review, but there is abundant information available on Internet websites and in newsletters.

Action 1.

No action is planned.

5.1.24 General Issue 24: Need for More Research and Data Collection (WMP 2000)

Issue Description: *"There is a lack of data on fauna along the watercourse as well as a need for more research on the ecosystem, biology and hydrology of the area. More and up-to-date information will help in the decision making process."*

Issue Source: Public

Response: The need for more research and data collection was noted in the WMP (2000). Results of current and ongoing research, once completed, are available to the public. The Information Needs portion of the WMP was expanded and some of the items were completed during the 2000 and 2009 period.

Action 1.

An Information Needs section was developed and expanded over the 2000 to 2009 period.

Responsible Agency: All

Status: Ongoing

An update on the status of the information needs is dealt with at the SAC meetings. The information needs section is updated as required. The information needs are found in Section 7.

5.1.25 General Issue 25: Inadequate Control of Tributaries during Spring Runoff (WMP 2000)

Issue Description: *"More work needs to be done on the impact of inflows from the York River and tributaries from Algonquin Provincial Park, Opeongo Lake and watersheds in the Bancroft District."*

Issue Source: Public

Response: OPG management of the flow of water in the Madawaska River is coordinated with MNR-controlled headwater lakes. The coordination of the flows has evolved over the years. OPG and MNR Pembroke District have re-established a direct communication between Bancroft district and Algonquin Park. There is a concern about the

impact of high York River flows on Kamaniskeg Lake and locations downstream. The problem is a function of storage facilities on this tributary. There is not enough storage to capture and redistribute the natural flow over a longer period at a reduced rate. Construction of storage facilities is beyond the scope of this review.

Action 1.

The operation of the Baptiste Lake dam will be reviewed to see if it can be used to reduce York River peak freshet flow.

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.1.7

5.1.26 General Issue 26: Need for Overall Madawaska River Watershed Plan (WMP 2000)

Issue Description: *"There should be an overall Madawaska River Watershed Plan."*

Issue Source: Public

Response: The Madawaska River Water Management Review is being undertaken as a result of issues and concerns that relate specifically to the river. A Watershed Plan has a broader scope that includes land use planning. Municipal planning processes and the Madawaska Highlands Land Use Plan are in place to address land use concerns relating to remainder of the watershed. The requirements for a WMP under the LRIA are limited to levels and flows. Watershed plans are beyond the scope of the WMP process.

Action 1.

Private land use concerns are to be directed to the appropriate, accountable municipal government.

Responsible Agency: All

Status: Ongoing

Action 2.

General Issue 17 addresses the issue of developing a protocol between MNR and OPG for changing water levels relating to the spring freshet and the impact of fish spawning, but it does not mention low water level conditions.

Responsible Agency: MNR and OPG

Status: Ongoing

Staff from both agencies communicate before, during and after spawning periods and consider all aspects of water levels, flows and temperatures in those discussions.

5.1.27 General Issue 27: Process for Plan Amendments (WMP 2009)

Issue Description: *"A mechanism does not exist to amend the water management plan, if warranted, in the Madawaska River Water Management Review."*

Issue Source: Public

Action 1.

The SAC recommended that a procedure was needed to amend the WMP, if warranted, and that the process be handled by a sub-committee to make recommendations to the SAC.

Responsible Agency: MNR

Status: Complete

The WMPG for Waterpower (2002) outlines a formal process for amending a WMP. Refer to section 1.9 for the amendment procedure.

5.1.28 General Issue 28: Quality of Fishery above Bark Lake Dam/Fisheries Assessment in Headwater Lakes and Streams (WMP 2000)

Issue Description: *"There is a need for fisheries assessment work in headwater lakes and streams. Walleye were introduced into some of these water bodies recently. Productivity and spawning areas are unknown."*

Issue Source: Public

Response: MNR offices in Bancroft District and Algonquin Provincial Park have information on walleye and other fisheries in these areas.

Action 1.

MNR will make this information available on various lakes from existing databases to interested parties on request.

Responsible Agency: MNR

Status: Complete

This information is available (For example Aylen Lake, Opeongo Lake).

5.1.29 General Issue 29: Protocol for Interagency Communications and Decision Making between OPG and MNR for Water Release during Low Water and Dry Weather Periods (WMP 2000)

Issue Description: *"There is no formal process in place to ensure a coordinated approach between OPG and MNR offices in Bancroft, Pembroke and Algonquin Provincial Park, for regulating water levels upstream from Bark Lake in the event of significant low water occurrences and extreme dry weather conditions impacting Bark Lake."*

Issue Source: Public

Response: MNR and OPG have not traditionally planned for low water level occurrences in the Bark Lake area around the Village of Madawaska, because concerns and issues generally have been related to high water levels and flooded basements.

It is important to recognize that, in 1999, the level of Bark Lake for some of the days in May, June and July 1999 were the lowest on record. The entire Province of Ontario was experiencing extreme low water levels in 1999, with the Great Lakes having a 32-year low.

Section 5.1.17 addresses the issue of developing a protocol between MNR and OPG for changing water levels relating to the spring freshet and the impact on fish spawning, but does not specifically mention low water level conditions.

Action 1.

MNR in Bancroft and Algonquin Provincial Park will add representatives to the OPG/MNR Working Group.

Responsible Agency: MNR

Status: Complete

Algonquin Provincial Park and Bancroft District MNR are represented at the OPG/MNR Working Group when needed. In addition, a representative from Algonquin Provincial Park attends the SAC Meetings. Bancroft District MNR is represented at the SAC meetings by Pembroke District MNR representatives.

Action 2.

MNR in Bancroft and Algonquin Provincial Park, with assistance from Pembroke, will work together to develop a process to consult with their clients at the upper end of the watershed regarding what to expect during extreme low water level and dry periods.

Responsible Agency: MNR

Status: Complete

Bancroft District has consulted with its major clients, the Aylen Lake Cottagers Association, as well as the Township of South Algonquin. Algonquin Provincial Park has discussed the possibility of low water levels at different times of the year with the Algonquin Leaseholders Association. The park has developed a list of clients who will be contacted should the park be considering major changes in water levels due to extreme water level conditions.

Action 3.

MNR and OPG will develop a protocol describing the process that will be followed for the release of water from MNR's dams upstream from Bark Lake, and provide contact names and telephone numbers for MNR/OPG communications during low water conditions and dry weather periods.

Responsible Agency: MNR and OPG

Status: Complete

Bark Lake and Kamaniskeg Lake have minimum flow requirements that must be met. In low flow years, OPG will release water from storage to fulfill these requirements.

Many MNR facilities are being converted to weirs and this will reduce the ability of MNR to draw water from storage. MNR also manages its facilities to balance competing needs. MNR will determine how much water

can be released from storage during low flow years to fulfill various needs above and below its facilities.

In 2000, the Ontario Government established the Ontario Low Water Response. This provincial plan was revised in 2003. The plan specifies what monitoring shall be carried out by the province and what coordination will exist amongst the various provincial ministries and local municipalities.

Action 4.

OPG will investigate the feasibility of installing a temporary gauge in the Madawaska River, upstream from Bark Lake, between the Villages of Madawaska and Whitney, so that both organizations can better monitor water flows, particularly in the spring, and to help estimate the discharge of water from upstream outflows.

Responsible Agency: OPG

Status: Complete

Information Need: 7.1.8

OPG installed temporary gauges upstream of Bark Lake in 2000 to explore the flow relationship. OPG installed a temporary gauge in Galeairy Lake and downstream of Galeairy Lake as well as in Opeongo Lake and downstream of Crotch Lake. Water levels fluctuated at both sites and match up fairly well with flow releases.

MNR provides regular updates on levels and flows and there are no significant benefits of having additional gauges.

Action 5.

OPG and MNR will be more vigilant in monitoring the pre-spring and spring conditions, including ground conditions (level of water table, whether or not the ground is frozen), rate of snow-melt and run off, amount of water in the snow.

Responsible Agency: MNR and OPG

Status: Complete

The volume of water in the spring is dependent on the precise sequence of events which can not be predicted well in advance. Although the level of the water table or presence or absence of a frozen ground surface can influence the amount of melt, the factors by themselves do not determine a large or small volume of water in the spring.

OPG did monitor ground water levels at a number of locations throughout the basin between 1949 and 1986. The information was gathered to provide an indication of water supply conditions. The monitoring was discontinued as it did not provide any significant benefit. A review of the information was presented at the September 26, 2001 SAC Meeting (#6).

OPG will not monitor ground water levels as it does not provide any additional information.

Action 6.

OPG will model varying drawdown patterns to determine impacts.

Responsible Agency: OPG

Status: Complete

Information Need: 7.1.9

The refill of Bark Lake in 2001 did not reach the summer minimum until early July. Action items 5 and 6 committed OPG and MNR to monitor a number of environmental variables and review the drawdown strategy. It is not possible to have a significant increase in the probability of refilling Bark Lake to the summer minimum without also increasing the risk of downstream flooding.

Action 7.

Communications between OPG, MNR and the local residents will be improved.

Responsible Agency: MNR and OPG

Status: Complete

The website, toll-free numbers, and annual stakeholder meetings have improved the communication between OPG and the local residents.

5.1.30 General Issue 30: Degree Growing Days During Walleye Incubation Period (WMP 2009)

Issue Description: *"Members of the Walleye Watch are volunteers who record conditions at a number of spawning shoals during the spawning and incubation period. The Walleye Watch members record information that is used to determine the start and peak of the spawning period as well as the end of the incubation period. Information collected includes the number of fish and water temperature.*

MNR organizes and manages the Walleye Watch volunteers. Interest in participating as a member has been declining and the amount of time that members are willing to invest has also been declining."

Issue Source: MNR

Response: OPG will investigate the possibility of installing water temperature probes to assist in the calculation of degree growing days for the walleye at select facilities. This information will be used to enhance\supplement work by the Walleye Watch members with the intent of reducing the amount of time and number of trips required by volunteers. Temperature probes will be installed on the downstream face of a few dams, as it is difficult to place them directly on the shoals and get access to the data.

Action 1.

OPG will install water temperature probes to assist in the calculation of degree growing days at a few sites.

Responsible Agency: OPG

Status: Incomplete

Information Need: 7.1.10

Action 2.

MNR will use the OPG supplied water temperature data in combination with the information supplied by the Walleye Watch to determine the degree growing days.

Responsible Agency: MNR

Status: Incomplete

5.2 MADAWASKA RIVER

5.2.1 Madawaska River Headwaters to Madawaska Village

5.2.1.1 Madawaska River Reach 01, Issue 01: Algonquin Provincial Park Water Levels (WMP 2000)

Issue Description: *"The control of water levels in Algonquin Provincial Park has a bearing on downstream flow. Concerns have been expressed by commercial operators on the Madawaska River in the park, regarding the impact/effect of any major water fluctuations on their businesses."*

Issue Source: Public

Response: MNR has indicated that no major changes are planned. Lakes in the park operate within a narrow band and their contribution to water level management downstream outside of the freshet period is negligible.

Action 1.

MNR will review Algonquin Provincial Park water level operations.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.1.1

MNR is converting a number of the dams to weir structures. The conversion is part of the life cycling planning of the provincial infrastructure. These new structures will not require any log sluices and the discharge from them will change base on the inflow and the weir discharge relationship. Flow will rise and fall based on changing weather conditions.

5.2.1.2 Madawaska River Reach 01, Issue 02: Bank Erosion Upstream of Bark Lake (WMP 2000)

Issue Description: *"The upper Madawaska River flows through a predominantly sand valley. Conspicuous bank erosion is occurring on the river 7 km upstream of Bark*

Lake. There are concerns that this is aggravated by Bark Lake water level fluctuations and the wakes from power boats".

Issue Source: Public

Response: The first set of rapids on the upper Madawaska River occurs at the Town of Madawaska (upstream end of the Breshnahan property). The rapids are exposed in the winter when Bark Lake is drawn down, but flooded in the summer when Bark Lake is full. In the winter, these rapids will act as a hydraulic control for upstream water levels. In the summer it is not yet known if the rapids or the dam are the primary control of water levels in the upper river.

Erosion is a complex naturally occurring phenomena. Section 5.1.3 provides an overview of the erosion process and complexity in identifying the source of the problem. The Bark Lake operating range is 18 cm in the summer. More than 18 cm can be used to support minimum flow requirements. Daily and weekly water fluctuations are usually far less than 18 cm per day. However, wind and power boat wake may result in a greater amount of variation.

Flooding of the rapids at the Town of Madawaska in May allows boaters access to the upper river during the summer. Boat wakes may aggravate erosion. Prevention of boat passage at the rapids would require a decrease in the mean summer elevation of the lake by an unknown amount, and could affect existing recreation and tourism on Bark Lake.

Private property owners are encouraged to erect signs directing boaters to operate their vessels more slowly.

Action 1.

OPG will determine if water levels in the upper river are controlled by the Bark Lake Dam or by the rapids at the Town of Madawaska.

Responsible Agency: OPG

Status: Incomplete

Information Need: 7.2.1.2

5.2.2 Madawaska Village to Bark Lake Dam

5.2.2.1 Madawaska River Reach 02, Issue 01: Bark Lake Dam Flows (WMP 2000)

Issue Description: *"There are concerns about the impact of outflows from Bark Lake to cover fish spawning areas at Bells Rapids on summer target elevations on Bark Lake."*

Issue Source: Public

Response: In the spring of 1997, Bark Lake was lowered to provide water to cover the Bells Rapids spawning bed during the walleye egg incubation period. Bark Lake did not recover to the summer minimum until the end of August 1997 because of extremely dry conditions in the watershed. This hampered recreation and tourism on Bark Lake. In this instance, protection of fish habitat receives priority over recreational and tourism needs because of the legal protection provided for fish habitat under the Federal Fisheries Act.

Refer to section 5.2.3.10 for more details on the walleye flow requirement.

Action 1.

No action is planned.

5.2.2.2 Madawaska River Reach 02, Issue 02: Effect of Water Level Fluctuations on Riparians (WMP 2000)

Issue Description: *"There is a need to find balance between flows required for operation of Madawaska Kanu Centre (MKC), flows for walleye spawning, and maintaining elevations for shoreline property owners and boaters in Bark Lake."*

Issue Source: Public

Response: The protection of fish habitat has a priority over recreational activities. The walleye spawn\incubation flow requirements are outlined in section 5.2.3.10. OPG must also pass the minimum flow requirements at Bark Lake and Kamaniskeg Lake.

Floating dock systems are recommended to reduce problems associated with fluctuating water levels and the draw that may occur to support the minimum flow requirements. The compromise between downstream users and Bark Lake users is detailed in section 5.2.3.1.

Action 1.

No action is planned.

5.2.2.3 Madawaska River Reach 02, Issue 03: Flooding at Madawaska Village when Bark Lake is at its Maximum Elevation (WMP 2000)

Issue Description: *"Basements in the Village of Madawaska can flood when Bark Lake is held at its maximum elevation."*

Issue Source: Public

Response: The Licence of Occupation provides flooding rights for OPG on Bark Lake to 313.94 m. OPG limited the level to rise to 313.90 m from 1999 until 2008. Between 1999 and 2008, basement flooding still occurred despite the small reduction in the operating limit. In 2003, basement flooding occurred when flows were high and the level was as low as 313.27 m.

Significant amounts of rain were recorded in the fall of 2003. Basement flooding was reported between November 13 and December 11. Over the basement flooding period, the inflow peaked at 126 m^3/s on November 21, 2003. The level started off at 313.78 m and slowly declined to 313.27 m by December 11.

Basement flooding also occurred following periods of heavy rain in June 2005 and November 2006. From June 15 to June 30, 2005 inflows peaked at 60 m^3/s while levels ranged from 313.77 to 313.71 m. From November 17 to November 28, 2006 flows peaked at 80 m^3/s and the level varied between 313.80 to 313.75 m.

Site visits over the years indicate that some buildings lack sump pumps while others had local drainage problems. Sump pumps were running into ditches that were full with very little flow through them. Basement flooding was found to be a problem for buildings along the river and at some locations on the lake.

The experience between 1999 and 2008 has shown that levels more than 60 cm below the absolute maximum failed to prevent basement flooding. It is not reasonable to maintain this reduction or to increase it given that other factors; including local drainage issues and adequate setbacks from water bodies and development in the floodplain plays a significant role.

Action 1.

OPG will write an operating procedure for Bark Lake voluntarily limiting the upper range to 313.90 m to reduce potential basement flooding in the Village of Madawaska.

Responsible Agency: OPG

Status: Complete

This action has failed to prevent basement flooding and will not continue as part of the WMP 2009. Local drainage problems and the lack of sump pumps are believed to be play a significant role in the amount of basement flooding that occurs during wet periods of the year.

Action 2.

OPG will review to determine if the flows in the river section are responsible for the flooding problem or Bark Lake levels when conditions permit.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.2.1

Site visits in 2003 indicate that basement flooding occurs at a number of buildings that are along the river upstream of Bark Lake as well as at some buildings that are located near the Lake and a creek. Basement Flooding was not confined to the river reach upstream of Bark Lake.

5.2.2.4 Madawaska River Reach 02, Issue 04: Narrow Operating Limits (+/- 6 cm) on Bark Lake in the Summer (WMP 2000)

Issue Description: *"In response to requests from year-round and seasonal residents of Bark Lake, water level elevations on the lake are maintained within a narrow range during the summer period. This presents challenges to water managers, particularly in very high and low water years, in terms of maintaining a balance among the needs of other river uses/users. OPG would like to increase the 313.68 - 313.80 m range to 313.62 -313.80 m to provide staffing flexibility."*

Issue Source: OPG

Response: The additional 6 cm should not impact tourist operations and recreational opportunities on Bark Lake. OPG would like an increase in operating range for staffing flexibility. The additional 6 cm of summer operating range (313.62-313.80 m) would allow OPG to reduce the number of log operations and associated costs. Log operations during freshet will be done as required and daily if necessary to manage levels.

The summer maximum level of 313.80 m will not be continued in the 2009 plan. The upper range between 313.80 to 313.94 m was used to provide a buffer to allow time to react to sudden increase in flow caused by rain events. OPG is obligated to operate below 313.94 m and will still provide a buffer below the operating maximum of 313.94 m. However, this buffer will be based on the risk factors which change with time.

Action 1.

The summer operating range will be increased to 313.62-313.80 m. OPG will write the Bark Lake directive to include the revised operating range.

Responsible Agency: OPG

Status: Complete

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.5 lists the constraints and conditions that OPG must follow. The summer maximum has been removed from the WMP.

Action 2.

The summer maximum will be removed and the operating maximum of 313.94 m will become the upper limit.

Responsible Agency: OPG

Status: Complete

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.5 lists the constraints and conditions that OPG must follow.

5.2.2.5 Madawaska River Reach 02, Issue 05: Destruction of Lake Trout Population in Bark Lake (WMP 2000)

Issue Description: *"There is no longer a self-reproducing lake trout population in Bark Lake because of the 10 m winter drawdown. The drawdown normally takes place from January to the end of March."*

Issue Source: Public

Response: MNR supports the Bark Lake lake trout population with hatchery plantings.

OPG will contribute to the cost of fish restocking programs on Bark Lake. Consideration will be given to excluding all shoals (for example, fencing), timing of drawdown, lowering the shoals, or other possible solutions.

Action 1.

OPG agrees to contribute to the cost of stocking lake trout in Bark Lake.

Responsible Agency: MNR and OPG

Status: Ongoing
OPG has paid half the cost of stocking since 2000.

Action 2.

Review deep spawning lake trout research for application to Bark Lake.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.2.2

There are numerous restrictive rules regarding the importing of exotic fish species into Canada/Ontario. There would need to be DFO involvement. MNR has a policy that prevents the introduction of new species into Ontario lakes. However, MNR is modifying the trout species to another commonly used strain and will use few larger fish.

5.2.2.6 Madawaska River Reach 02, Issue 06: Effects of Winter Drawdown on Furbearers in Bark Lake (WMP 2000)

Issue Description: *"The over-winter drawdown on Bark Lake causes beaver and muskrats to abandon their lodges/houses and they are often seen walking over the ice, along the shoreline or on nearby roadways in the middle of the winter."*

Issue Source: Public

Response: It is recognized that the over-winter drawdown has an effect on species of aquatic wildlife. Beavers and muskrats would be left without water around their lodges/houses when the over-winter drawdown occurs. This would cause beavers and muskrats to abandon their homes and go looking for a new home. In the middle of winter, this is not a good time and most displaced animals would fall victim to predators or the elements.

MNR is preparing a report on the current status of furbearers. Additional information must be gathered to make informed decisions. Crown trap line operators and private trappers must be consulted.

Action 1.

MNR will provide a furbearer status report.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.2.3

The report was issued completed in 2001.

Refer to section 11.

Lamont, Mark (2001).

Action 2.

A fall inventory of active beaver and muskrat lodges/houses should be completed to investigate the number of animals affected and to provide a local trapper with locations for trapping. If significant numbers of animals are observed, an annual survey will be considered. The preliminary survey and report will be included in the Information Needs Section.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.2.3

The report was issued in 2001. Annual surveys have not been conducted.

Refer to section 11.

Lamont, Mark (2001).

5.2.2.7 Madawaska River Reach 02, Issue 07: Need to Undertake a Study to Determine the Impact of the 1999 Record Low Water Levels on Fish and Wildlife in Bark Lake (WMP 2000)

Issue Description: *"Bark Lake experienced its lowest recorded water levels in fifty years in 1999. There is a concern about the impact of these low water levels on fish and other wildlife species. The destruction of spawning grounds, e.g. shallows where bass spawn, could have a long lasting impact on the bass population in Bark Lake. Bark Lake is heavily fished, particularly during the winter months through ice fishing. There is a concern that one species of fish will have its habitat depleted to ensure that other species spawn successfully."*

Issue Source: Public

Response: The level of Bark Lake for some of the days in May, June and July 1999 were the lowest on record. The impact of low water levels in 1999 on other wildlife is not yet known. The effect on wildlife populations will be assessed concurrently with the issue identified in section 5.2.2.6, assessment of furbearers.

Bark Lake no longer produces a natural lake trout population. It must be stocked annually and does create a "catch and release" situation. However the growth and survival of these stocked lake trout has been questionable. This may be due to the large drawdown in the littoral zone and forage specifically that of the invertebrate population which young lake trout feed on may have been reduced to a point that effects growth of juvenile lake trout stocking. The strain stocked in recent years may have also played a role. MNR had conducted a survey of the lake population in 2007 and has concluded that Bark Lake will require larger more piscivorous type lake trout stocking than in previous years. The plan is to stock approximately 100 gram size fish

as opposed to 20 grams. This will equate to between 7,000-10,000 sub-adults annually. There is a plan to also go back to the Lake Manitou strain used in the 1970s - mid 1990s

Walleye stocking is undertaken annually by private citizens and the local fish and game club. It is felt that the walleye population is doing well and was not affected by the low water levels because the fish spawn upstream of Bark Lake in the Madawaska River.

Action 1.

A study will be undertaken to assess the status of Bark Lake's fish and wildlife populations, with an emphasis on the impact of the 1999 record low water levels.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.2.4

FWIN was completed in the fall of 2001. Assessment of the status of fish and wildlife resources is done throughout the district. No formal assessment of Bark Lake specifically has been done.

5.2.2.8 Madawaska River Reach 02, Issue 08: Bark Lake Pre-Freeze Up Drawdown (WMP 2009)

Issue Description: *"Start the drawdown of Bark Lake prior to the formation of an ice cap to reduce shoreline erosion and damage to docks. A draw of 3.0 m prior to the formation of an ice cap on Bark Lake is suggested."*

Issue Source: Public

Response: A request from the public was made to start the drawdown of Bark Lake prior to the formation of an ice cap. The reason for the drawdown was to reduce shoreline erosion and damage to docks. The original request suggested a 3.0 m draw prior to the formation of an ice cap on Bark Lake. Requiring a drawdown in December of 3.0 m would be a significant deviation from the typical operating pattern and have an impact on flows and levels all the way to the Ottawa River.

Refer to section 5.1.3 for more information on the complexities regarding erosion and section 5.1.9 for water level fluctuations. Damages to docks can be reduced by using removable floating docks. Ice damages happen periodically when a number of environmental conditions occur. Dropping the water level below a specified level will not prevent erosion or ice damages.

Action 1.

OPG agreed to test a winter maximum of 313.40-313.30 m starting in the winter of 2002.

Responsible Agency: OPG

Status: Complete

OPG carried out the test from winter 2002 until winter 2006. OPG will not continue to force a drawdown of Bark Lake in December of each year. The timing of the drawdown and the choice of the start date provide operating flexibility to move energy into periods of greatest demand.

Forcing a late fall or early winter drawdown places the responsibility to prevent damages on OPG when in fact individuals can take some minor actions that will have a much better outcome.

Maintaining a natural functioning shoreline and using floating docks that are removable will have a much greater impact on reducing damages than any reduction in the water level prior to the freeze-up.

5.2.3 Bark Lake Dam to Palmer Rapids Dam (Kamaniskeg Lake)

5.2.3.1 Madawaska River Reach 03, Issue 01: Flow requirements for recreational uses (WMP 2000)

Issue Description: *"The perception is that MKC receives additional flow releases from Bark Lake to operate its white-water program at expense of Bark Lake users."*

Issue Source: Public

Response: MKC has received mid-week flow releases from Bark Lake from May to September to support its white-water operations since 1969. In most years, providing the flow releases through the week for MKC has no impact on maintaining Bark Lake in the summer operating range.

MKC and the associated tourist industry cannot operate without periodic daytime midweek releases. A compromise has been proposed for Bark Lake flow releases from May to September that balances upstream and downstream users during dry conditions.

The following conditions will be continued into the WMP 2009:

1) MKC receives the 26 hours of midweek water dispatch (25.6 m3/s) until Bark Lake reaches 313.62 m.
2) MKC midweek water reduced from 26 hours per week to 18 hours per week when the level is between 313.62 - 313.50 m.
3) When Bark Lake reaches 313.50 m, Bark Lake discharge will be reduced. The amount and timing of flow releases will depend on inflow conditions, time of year and impact.

The Bark Lake minimum flow is 2.8 m^3/s. This is a fisheries requirement and must be met. If the inflow into Bark Lake is less than 2.8 m^3/s during a drought, the lake level will decline even without white-water releases.

The minimum daily average flow at the Arnprior GS is approximately 10 m^3/s for effluent dilution requirements. The minimum flow from Kamaniskeg Lake is 10 m^3/s. During low flow years, Bark Lake and or Kamaniskeg Lake must be drawn to support this flow requirement. Under most cases, local inflow from Kamaniskeg Lake to Arnprior GS, combined with the approximately 2.8 m^3/s from Bark Lake is enough to provide for the Arnprior minimum daily average flow. Additional water from Bark Lake to support the Arnprior minimum over and above the approximately 2.8 m^3/s may be required, thereby potentially reducing Bark Lake levels below 313.50 m during dry periods.

Action 1.

OPG will write a procedure for operating Bark Lake during dry conditions. This procedure has been incorporated into the WMP.

Responsible Agency: OPG

Status: Complete

Refer to section 9.2.5 for more details.

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.5 lists the constraints and conditions that OPG must follow for Bark Lake.

5.2.3.2 Madawaska River Reach 03, Issue 02: Effect of Water Level Fluctuations on Residents and Commercial Tourist Operators (WMP 2000)

Issue Description: *"High elevations cause shoreline erosion and low elevations create problems for launching boats. Water level fluctuations in winter can cause ice damage to docks."*

Issue Source: Public

Response: Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

OPG currently manages Kamaniskeg Lake in a narrow band through the summer tourist season to enhance recreational opportunities. The summer operating range is 282.91 - 283.09 m. This range was adopted in WMP 2009.

Excessive boat speed and associated wakes are a problem and contribute to erosion. The Federation of Ontario Cottagers' Associations has posted warning signs limiting boat speed to 10 km/hr within 30 m of the shoreline. In 1992, Ontario's Boating Regulations were amended to establish a new shoreline speed zone that requires all power-driven vessels to operate at 10 km/hr or less within 30 m of a shore. The restriction does not apply in areas previously posted with a shoreline speed limit; in buoyed channels and canals; on rivers or sections of rivers that are less than 100 meters in width; and to vessels towing a person on water skis, a surf board or any such equipment provided the vessel follows a trajectory that is perpendicular to the shore, or the vessel is operated within an area designated by buoys as an area in which such operation is permitted.

Removable, floating dock systems are recommended to avoid ice damage associated with fixed docks. Refer to sections 5.1.3 and 5.1.9 for more information on erosion and water level fluctuations.

Action 1.

No action is planned.

5.2.3.3 Madawaska River Reach 03, Issue 03: Narrow Operating Limits (+/- 6 cm) on Kamaniskeg Lake in the Summer (WMP 2000)

Issue Description: *"In response to requests from year-round and seasonal residents of Kamaniskeg Lake, the water level on the lake is maintained within a narrow range of 282.94 m - 283.06 m during the summer period. OPG would like to increase the range to 282.88 - 283.06 m to provide staffing flexibility."*

Issue Source: OPG

Response: The operating range increase is not expected to have a negative impact on tourist operations or recreation. The additional 6 cm of summer operating range will allow OPG to reduce the number of log operations and associated costs. Log operations during freshet will be done as required, and daily if necessary.

Action 1.

The summer operating range will be increased to 282.88 - 283.06 m. OPG will write required changes to the Kamaniskeg Lake operating procedures.

Responsible Agency: OPG

Status: Complete

The summer operating range was changed to 282.88 to 283.06 m from 282.94 to 283.06 m as part of the water Madawaska Review process (1995-2000). Numerous low water complaints were received in 2001 and 2002 from the Negeek Lake area when the elevation was near the lower end of the summer operating range. The summer operating range was adjusted to 282.94 to 283.12 m on a trial basis in 2003. Numerous high water complaints were received in 2003 when the elevation was near the summer operating maximum. The summer operating range was adjusted to 282.91 to 283.09 m on a trial basis in 2004 and was adopted in the WMP (2009).

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.6 lists the constraints and conditions that OPG must follow for Kamaniskeg Lake.

5.2.3.4 Madawaska River Reach 03, Issue 04: High water Level Elevations Below Bark Lake Dam During Fall/Winter Drawdown (WMP 2000)

Issue Description: *"During the fall/winter drawdown of Bark Lake, water levels in Kamaniskeg Lake are increased to high levels due to a "bottleneck" in the outflow at Palmer Rapids."*

Issue Source: Public

Response: The Palmer Rapids dam is a bottleneck during extremely high flows that require the level of Kamaniskeg Lake to rise in order to increase the discharge capacity of the dam. Flows that cause this situation historically occur in the spring during freshet. The additional water from the fall/winter drawdown of Bark Lake combined with local inflow to Kamaniskeg Lake is usually not enough to cause the Palmer Rapids dam to be a bottleneck and raise the lake level during this time period.

Channel improvements at Palmer Rapids dam in 1967 increased the capacity of the dam. The bottling that occurs is much less than it would have been prior to the channelization of 1967. The flooding potential on Kamaniskeg Lake is usually less because water can be stored in Bark Lake and the channelization at the Palmer Rapids Dam increased the discharge capacity.

Action 1.

No action is planned.

5.2.3.5 Madawaska River Reach 03, Issue 05: Augmented Late-Winter/Spring Flows on Kamaniskeg Lake (WMP 2000)

Issue Description: *"The local inflow and discharge data to Kamaniskeg Lake during the winter have a peaking shape. The distribution of flows out of Kamaniskeg Lake may be attributable to the water management of Baptiste Lake."*

Issue Source: Public

Response: OPG historic records of inflow to Kamaniskeg Lake spike during January and increase the Palmer Rapids flow.

Action 1.

The Kamaniskeg Lake and York River data will be reviewed to confirm the values. MNR data for Baptiste Lake will be correlated.

Responsible Agency: OPG

Status: Incomplete

Information Need: 7.1.7

Action 2.

The water management of Baptiste Lake will be reviewed to determine if the impact on Kamaniskeg Lake can be modified.

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.1.7

5.2.3.6 Madawaska River Reach 03, Issue 06: Effect of Water Level Regulation on Productivity of Aquatic Species and Furbearers at Conroy's Marsh (WMP 2000)

Issue Description: *"Kamaniskeg Lake water levels are managed during the summer for recreation and tourism within a narrower range (283.0 m +/-6 cm) than would occur naturally. The level of Kamaniskeg Lake controls the level of Conroy's Marsh. The question is whether this is having an adverse effect on the productivity of the marsh. It appears that duck and amphibian populations are not as abundant as they might otherwise be."*

Issue Source: Public

Response: A four-month summer drawdown of 1 m or more would be beneficial for the marsh ecology, birds, fish, furbearers, and other creatures but would impact recreational use of Kamaniskeg Lake. A change in operation will require public consultation.

The summer operating range was adjusted to 283.00 +/- 0.09 m in 2004.

Action 1.

MNR contacted Ducks Unlimited in 1998 to assess the condition of the marsh and provide recommendations for rehabilitation if necessary. Ducks Unlimited will submit a report in 1999.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.3.1

Ducks Unlimited did not complete or submit a report. Three reports have been prepared to help assess the state of the wetlands on the Madawaska River. There is no evidence to support the statement that duck populations are not as abundant as they might otherwise be.

Refer to section 11.

Bland, David (2002).

Bland, David (2003).

Evans, Rob and Roswell, Jim (1998).

5.2.3.7 Madawaska River Reach 03, Issue 07: Effect of Winter Drawdown on Muskrat in Conroy's Marsh (WMP 2000)

Issue Description: *"The drawdown on Conroy's Marsh has been limited during freeze-up so that muskrat are not trapped in their lodges by the collapsing ice."*

Issue Source: Public

Response: OPG currently limits the winter water level fluctuation on Kamaniskeg Lake to limit the impact on muskrat. The lake is usually lowered to 282.85 cm before ice has formed and then operated within a -9cm to +3cm band. This method of operating has been in place for several decades and its effectiveness has not been measured.

Action 1.

Review the status of the muskrat population and assess whether the winter operating practice has value for the health of the overall marsh ecology. MNR is currently preparing a furbearer report to help answer some questions.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.3.2

The report was issued in June 2001

Refer to section 11.

Lamont, Mark (2001).

5.2.3.8 Madawaska River Reach 03, Issue 08: Erosion at Bells Rapids (WMP 2000)

Issue Description: *"A concern was expressed about erosion occurring at Bell's Rapids where the river has been diverted. The river channel has been changed by natural erosion processes. Fallen timber has created a safety hazard for kayakers at the diversion."*

Issue Source: Public

Response: Erosion at Bells Rapids where the river was diverted is being addressed. A work permit was issued by MNR to MKC with DFO approval.

Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

Action 1.

MKC will undertake the remedial work under the work permit and DFO approval.

Responsible Agency: MNR

Status: Complete

Erosion protection work was carried out in 2003. MKC assisted with the work by removing the fallen timber hazard and MNR contracted a local construction company to do the shoreline stabilization and mitigation work.

MNR continues to monitor erosion and minimum spawn flows for spawning at Bell's Rapids.

5.2.3.9 Madawaska River Reach 03, Issue 09: Information on Negeek Lake (WMP 2000)

Issue Description: *"Information on the limnology and morphology of Negeek Lake and its fish populations is not available."*

Issue Source: Public

Response: OPG hired a consultant to carry out a lake survey. The report was completed in 1999. Refer to the information needs in section 7.

Action 1.

Field work is complete and the report was published in 1999.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.3.3

Refer to section 11.

Rosien, Darwin (1999).

5.2.3.10 Madawaska River Reach 03, Issue 10: Impact of Flows out of Bark Lake (WMP 2000)

Issue Description: *"A concern exists that sufficient water is released from Bark Lake in the spring to cover the Bell's Rapids spawning area."*

Issue Source: Public/MNR

Response: Flow tests of 6 m^3/s, 15 m^3/s and 25 m^3/s were conducted in the fall of 1997 to measure spawning bed coverage at various flows. Observations of 50 m^3/s flow were also made in May 1997. The backwater effect from Kamaniskeg Lake was observed to cover most of the spawning bed at the base of the rapids regardless of the river flow. There was no appreciable difference in coverage within the rapids between the 25 m^3/s and the 50 m^3/s flow scenarios. The 15 m^3/s flow also provided good spawning conditions although some suitable spawning substrates are exposed when flows are reduced from 25 to 15 m^3/s.

The river channel at Bells Rapids has gone through some changes and multiple channels now exist. MNR observations in 2007 indicate that a 5 m^3/s flow during the incubation period would be sufficient under low flows, and that a 15 m^3/s threshold is sufficient, even if more than 25 m^3/s was discharged during the spawning period.

Action 1.

OPG will issue an operating procedure describing the water management guideline for walleye spawning in Bells Rapids. A report outlining results will be co-authored by MNR.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.3.4

Refer to section 9.2.5 for the details of the constraints.

Refer to section 11.

Pope, Gregory F. (1999).

Action 2.

Completion of proposed channel remediation by the MKC and MNR will enhance the Bells Rapids spawning site. OPG will conduct additional flow tests (10 m^3/s) to refine the operating strategy when the work is completed. Less water may be needed for the same spawning shoal coverage.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.3.5

MNR has assessed the rapids and have concluded that a 5 m^3/s threshold flow is now required for the incubation period.

Refer to section 9.2.5 for the details of the constraints.

5.2.4 Palmer Rapids Dam (Kamaniskeg Lake) to Griffith

5.2.4.1 Madawaska River Reach 04, Issue 01: Exposed spawning beds (WMP 2000)

Issue Description: *"Walleye spawn has been left high and dry below the Palmer Rapids Dam."*

Issue Source: Public

Response: The York River flow is relatively unregulated and provides most of the Palmer Rapids Dam flow during early freshet. As the York River flows recede and the corresponding Palmer Rapids flow drop, downstream water levels also decline like a natural river. If the walleye spawn during the peak flow period, they will likely be uncovered each year.

Action 1.

Further assess where walleye spawn in this reach and build spawning shoals where continuous coverage is ensured at all times.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.4.1

During the early to late 90s, the Madawaska Valley Fish and Game Club conducted many walleye watches to determine where walleye were spawning. Under high flows, the water enters the shallow bank at the end of the rapids along Pine Point. Erosion along the downstream end of Pine Point is believed to have made this area accessible to the walleye. The trees act as eddies for walleye to rest and also spawn. As the high flows recede, these eggs can be left exposed.

MNR along with the local Fish and Games Clubs will investigate site alterations to reduce erosion during high flows, enhance spawning areas, help to keep fish in the river channel and keep eggs from being exposed.

Action 2.

Local Fish and Game Club to apply for CFWIP funding to create spawning beds.

Responsible Agency: MNR and OPG

Status: Complete

Clubs have been advised of this opportunity for CFWIP funding and through the OPG Environment Fund.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.4.1

Action 3.

Determine who owns the lands along the shoreline where the walleye spawn.

Responsible Agency: MNR and OPG

Status: Complete

It has been determined that majority of land is Crown land.

Action 4.

MNR staff and the local Fish and Game Club will devise a plan for repairing the shoreline at Pine Point. The work will help to reduce erosion during high flows, enhance spawning areas, help to keep fish in the river channel and keep eggs from being exposed.

Responsible Agency: MNR

Status: Incomplete

Information Need: 7.2.4.1

5.2.4.2 Madawaska River Reach 04, Issue 02: Water Releases for Recreational Purposes (WMP 2000)

Issue Description: *"There is a need to better communicate water flow information to the white-water paddling community, especially about flows in the Palmer Rapids to Griffith reach."*

Issue Source: Public

Response: OPG provides level and flow information through a web site and a toll-free number.

Regular water level and flow web updates can be obtained at the following web address

http://www.opg.com/safety/water/river/madawaska/madriver.pdf

In 2004 OPG added a toll-free number (1-888-895-1592 extension 3395) so that members of the public can contact OPG about water level and flow issues on the Madawaska or Ottawa Rivers.

Refer to sections 5.1.7 and 5.1.8.

Action 1.

OPG's Madawaska River website will include linkages to MKC and Canoe Ontario's website.

Responsible Agency: OPG

Status: Complete

OPG did provide links to the MKC and the Canoe Ontario's website. However, they removed the links a few years later, as OPG now provides information through a website or a toll-free number. Web updates occur weekly or bi-weekly. An OPG employee can be contacted at a toll-free number to obtain level and flow information or other information.

5.2.4.3 Madawaska River Reach 04, Issue 03: Drowning of Furbearers (WMP 2000)

Issue Description: *"High flows and levels between Palmer Rapids and Griffith during the fall/winter drawdown leads to drowning of some muskrats and beavers."*

Issue Source: Public

Response: The increased flow from Bark Lake drawdown between December and February raises water levels in winter through this reach. Even if the drawdown period is extended, there would still be flows of 50 - 60 m^3/s during the winter. Bark Lake is the significant flood control reservoir on the Madawaska River. Reducing the drawdown and flood storage in Bark Lake would reduce the flows in this reach, but at a cost of increased downstream flooding potential in the spring. Increasing the flood potential was not an acceptable alternative.

The Bark Lake water management regime changed in late 1960s. There was usually a summer drawdown for power requirements so less flow was needed during the winter to empty it. The construction of Mountain Chute (1967) and expansion at other stations increased the capacity of OPG facilities to pass water and changed the river into a peaking system. The change in the mode of operation to a peaking system reduced the requirement for a summer drawdown of upstream reservoirs.

MNR is preparing a report on the current status of furbearers. Additional information must be gathered to make informed decisions. Crown trap line operators and private trappers must be consulted.

Action 1.

MNR will provide a furbearer status report.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.4.2

The report was completed in 2001.

Refer to section 11.

Lamont, Mark (2001).

5.2.4.4 Madawaska River Reach 04, Issue 04: Information on Walleye Downstream from Palmer Rapids to Griffith (WMP 2000)

Issue Description: *"Concerns exist regarding fish populations from Palmer Rapids to Griffith. Information on these populations is limited."*

Issue Source: Public

Response: The fish populations in this section of the river are very difficult to assess due to the riverine nature of this reach and limitations associated with using nets.

There is insufficient data available to determine the status of fish populations in this reach. Walleye Watch observes spawning activity at Palmer Rapids.

Action 1.

Studies are required to assess the fish community, populations and the angling effort for this reach.

Responsible Agency: MNR

Status: Incomplete

Information Need: 7.2.4.3

5.2.4.5 Madawaska River Reach 04, Issue 05: Availability of Water below Kamaniskeg Lake for Recreation (canoeing, kayaking, rafting, etc.) (WMP 2000)

Issue Description: *"What is the feasibility of operating Kamaniskeg Lake dam to allow great flow over weekends? More water could be released at Palmer Rapid in weekends in July and August (eight weeks a year when available)."*

Issue Source: Public

Response: There is a need to balance flow requirements with generation needs and impacts elsewhere on the river including Kamaniskeg Lake and on the reach of the river down to Mountain Chute. Impact may also be felt down to the flow-sensitive reach of Calabogie to Stewartville. Weekend releases would increase operating costs to OPG, which would have to be passed on to the users. The 18 cm range at Kamaniskeg Lake does not provide a significant amount of storage to provide additional water.

Action 1.

Proponents to develop a proposal addressing the need to establish additional water flow for weekends.

Responsible Agency: OPG

Status: Complete

A request for releases from OPG for defined weekends each season was received. OPG has not made any weekend release for white-water activities.

Action 2.

OPG, MNR and proponents to meet in the fall of 1999 to review and discuss the proposal.

Responsible Agency: MNR and OPG

Status: Complete

MNR and OPG agreed to meet with the paddling community to inform them about river operations on the upper Madawaska River, and to find out the issues and concerns from a paddler perspective. This workshop was an OPG and MNR commitment that was made in the January 2000 report. It was completed April 21, 2001.

Weekend and special event white-water releases from Kamaniskeg Lake (Palmer Rapids) were requested of OPG. An Upper Madawaska River stakeholder meeting is held annually to discuss operation issues.

A request for releases from OPG for defined weekends each season was received. OPG has not made any weekend releases for white-water activities due to the cost to provide them, the impacts of these releases on the recreational users of Kamaniskeg/Negeek Lake and the potential impact of such regular releases on the downstream ecosystem.

5.2.4.6 Madawaska River Reach 04, Issue 06: Palmer Rapids Dam Minimum Flow Requirement (WMP 2009)

Issue Description: *"... Request that the minimum water flow be returned to the original 14 m^3/s as opposed to the current rate of 10 m^3/s. Lower water flow increases the exposure of rocks and can change a safe rapid into a hazardous and virtually un-navigable rock garden."*

"The minimum flow in the past has been 15 m^3/s which is a much safer white-water recreation usage flow for kayakers and canoeists. .... Palmer Rapids is a very popular paddling spot in Ontario. To facilitate this wonderful "natural" recreation, it would be desirable to increase the minimum flow limit back to 15 m^3/s."

Issue Source: Public

Response: The Madawaska River is operated as a system. Changing the minimum flow to 14.2 m^3/s could have implications on the levels and flows associated with Kamaniskeg Lake and Bark Lake. An information need would need to be carried out before any change can occur.

Action 1.

Quantify the impact of increasing the minimum flow from 10 to 14.2 m^3/s at the Palmer Rapids Dam on the flows and levels at Bark Lake and Kamaniskeg Lake.

Responsible Agency: OPG

Status: Incomplete

This issue was added to the WMP 2009 during the public review of the draft WMP.

Information Need: 7.1.12

5.2.5 Griffith to Mountain Chute GS

5.2.5.1 Madawaska River Reach 05, Issue 01: Effect of Daily and Weekly Water Level Fluctuations During the Recreation Season (WMP 2000)

Issue Description: *"Low water levels during the summer leave boat-lifts and ramps inoperable."*

Issue Source: Public

Response: The summer operating minimum was changed from 247.80 m to 248.00 m for the peak summer period as part of the Madawaska Review process (1995-2000). In September 2002, the elevation of Mountain Chute was reduced from 248.00 to 247.80 m shortly after the end of the peak summer period, and remained close to the summer minimum for the remainder of the summer period. In October 2002, the elevation of Mountain Chute was also reduced below 247.80 m shortly after the end of the summer period, and remained below 248.00 m until the end of November. In 2003, a public meeting was held with Centennial Lake residents to discuss operations at Mountain Chute. Many of the residents were not happy with the sudden reductions in elevation in 2002 and requested a summer minimum level of 248.00 m for the entire summer period. OPG agreed, with recommendation from the SAC, to test out a new summer operating minimum of 247.80 or 248.00 m depending on the inflow into Mountain Chute in 2005. The summer limit is now a flow dependent value. When the inflow is greater than 70 m^3/s the summer minimum is 247.80 m, otherwise the summer minimum limit is 248.00 m. Refer to section 9.2.7.

The level can be drawn lower if there are energy and capacity shortages on the power grid. The summer minimum is applicable during the May long weekend to Thanksgiving weekend period.

Action 1.

The summer minimum will be 247.80 or 248.00 m depending on the inflow into Mountain Chute.

Responsible Agency: OPG

Status: Complete

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.7 lists the constraints and conditions that OPG must follow at Mountain Chute.

5.2.5.2 Madawaska River Reach 05, Issue 02: Effect of Fall High Water Levels at Freeze-up on Riparian Landowners and Shorelines (WMP 2000)

Issue Description: *"High water levels during freeze-up cause shoreline erosion problems."*

Issue Source: Public

Response: Centennial Lake was briefly lowered to 247.80 m (the lower summer operating limit) during freeze up. The level was then raised and the forebay operated in the normal operating range as needed by OPG for the balance of the winter.

The level at Mountain Chute was held until the ice cap was formed and then could be raised until the normal operating maximum. OPG agreed to a trial period of a winter maximum to be consistent with Bark Lake starting the winter of 2002. This prevented OPG from using the level above 248.00 m during the winter.

Refer to section 5.1.3 for more information on the complexities regarding erosion. Ice damages happen periodically when a number of environmental conditions occur. Dropping the water level below a specified level will not prevent erosion or ice damages. OPG already limits the use of the level between 248.40 and 249.00 m to periods of significant flooding or system contingencies.

Maintaining a natural functioning shoreline and using floating docks that are removable will have a much greater impact on reducing damages then any reduction in the water level prior to the freeze-up.

Action 1.

Additional tests are to be conducted to verify results of this action.

Responsible Agency: OPG

Status: Complete

OPG modified the conditions and continued the test until Winter 2006/2007.

Action 2.

A communiqué will be prepared on this issue explaining and describing a prefreshet flow strategy.

Responsible Agency: OPG

Status: Complete

OPG communicated the evolving conditions throughout the trial period at SAC Meetings.

5.2.5.3 Madawaska River Reach 05, Issue 03: Dry Wells Between Camel Chute and Griffith in Early Spring (WMP 2000)

Issue Description: *"When river levels between Palmer Rapids and Camel Chute are low, some residential wells in the Griffith area go dry. The problem of dry wells occurs when freshet is late and there are minimal flows in the river system because freshet drawdown at Bark Lake and Centennial Lake have been completed."*

Issue Source: Public

Response: Four wells are reported to be affected. It is believed that they are all dug wells or sand point wells. When the Mountain Chute forebay (Centennial/Black Donald Lake) is near the lower part of its drawdown, the river between Griffith and Camel Chute reverts back to its natural state before the reservoir was created. It is during that time that the dry wells have been reported.

Flood control is a priority for OPG. Changing the reservoir operating pattern and freshet drawdown to accommodate this concern is not an option because of the importance of flood control requirements. The volume and timing of freshet cannot be forecast precisely because of weather variables. OPG already schedules the drawdown to finish as close to the start of freshet as deemed reasonable to prevent undue flooding risks.

Installing a weir at Camel Chute to retain water in the reach may alleviate the dry well problem. The construction of a weir at this location would impede navigation and fish passage. The associated construction costs and permitting requirements combined with minimal benefits do not justify further investigation of this option.

The affected well owners should consider deepening their wells to solve this problem and are encouraged to consult with local well contractors to determine best well design in order to alleviate the problem.

Action 1.

No action is planned.

5.2.5.4 Madawaska River Reach 05, Issue 04: Pike Spawning Habitat (WMP 2000)

Issue Description: *"It is perceived by local anglers that the abundance of pike has declined over time. Pike spawn in shallow weedy marshes or littoral areas in the spring at ice break-up, their eggs hatch a few days later and the newly hatched fry may spend several weeks in shallow nursery areas. Water management may affect pike reproduction."*

Issue Source: Public

Response: Centennial Lake has a winter drawdown of 4.5 m. The lake may not be refilled quickly enough in the spring to allow pike access to appropriate spawning habitat. The reservoir can be filled earlier but this leads to a sacrifice of flood control during the late spring.

During reservoir filling in the spring, brief drawdown of a few days may lead to the stranding of spawning pike or eggs. While this has occurred rarely in the past, OPG has developed an operating instruction to continue raising the level of Centennial Lake once filling has started, to avoid the problem of stranding pike.

Action 1:

Further study is required to identify pike spawning areas and determine the effect of water management on pike reproduction.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.5.1

An assessment of pike and muskellunge habitat was completed in 1999.

Refer to section 11.

Rosien, Darwin (1999b).

Action 2.

Based on the results of the research, an action plan will be developed with OPG, MNR and local interests, and will be implemented in a timely manner.

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.2.5.1

5.2.5.5 Madawaska River Reach 05, Issue 05: Walleye Spawning Habitat and a Declining Walleye Population (WMP 2000)

Issue Description: *"Centennial Lake walleye are believed to spawn in the rapids at Camel Chute or Griffith at the end of April or early May. In some years, spawning may occur before filling of Centennial Lake is completed. The rapids at Camel Chute may be flooded by the reservoir after spawning, but before the eggs hatch. There has been a steady decline in walleye being caught by anglers, size of fish and quantity of fish are reduced compared to past years."*

Issue Source: Public

Response: Flooding of Camel Chute after spawning is not believed to have a negative effect on walleye egg incubation. There is insufficient data available to determine the state of the walleye fishery in this reach. Depending on the results obtained from assessing the fishery, an action plan will be developed to improve the fishery including enhancing spawning habitat, stocking fish and protecting fish stocks through regulation.

Action 1.

Further study is required to identify walleye spawning areas in Black Donald/Centennial Lake and the effects of reservoir management on it.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.5.2

The report was published in August 1999.

Refer to section 11.

Rosien, Darwin (1999b).

Action 2.

A Walleye Watch program will be implemented in this area.

Responsible Agency: MNR

Status: Complete

The Griffith and Mattawatchen Fish and Game Club carry this out annually.

Action 3.

A FWIN program was conducted on Black Donald/ Centennial Lake in 1998. The results were available in 1999.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.5.3

Study was issued in May 1999.

Refer to section 11.

Morgan, George (1999).

Action 4.

An action plan for Black Donald/Centennial Lake will be developed which may include habitat enhancement, stocking and regulation of the fishery.

Responsible Agency: MNR

Status: Complete

An action plan for Black Donald/Centennial Lake will be developed which may include enhancement, stocking and regulation of the fishery.

5.2.5.6 Madawaska River Reach 05, Issue 06: Effects of Reservoir Drawdown and Refilling on Riparian Habitats and Wetlands (WMP 2000)

Issue Description: *"Centennial Lake has many associated wetlands and shallow littoral areas that have potential to provide habitat for fish, amphibians, reptiles (i.e. water snakes, turtles), aquatic mammals (muskrat) and birds. These areas are subject to a 4.5 m drawdown during the winter which may lead to the destruction of perennial species by stranding, desiccation and freezing."*

Issue Source: Public

Response: The impact of the drawdown is recognized as a potential problem. This effect is a residual impact of providing flood control and flood control is a priority.

Action 1.

More information is needed on the effect of water management on the ecology of these wetlands.

Refer to the information needs in section 7.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.5.4

Refer to section 11.

Rosien, Darwin. (1999b).

Bland, David. (2002).

Bland, David. (2003).

5.2.5.7 Madawaska River Reach 05, Issue 07: Effects of Spring Flooding and Daily Summer Water Level Fluctuations on Waterfowl (WMP 2000)

Issue Description: *"Birds that nest on water (e.g. loons) may begin nesting before filling of Centennial Lake is complete (about May 24). After filling of the reservoir, small fluctuations in water level of about 0.40 m still continue on a daily and weekly basis. Reservoir filling may flood nests in the early spring, and subsequent fluctuations may also affect nesting success."*

Issue Source: Public

Response: The refilling of Centennial Lake controls the water level and depends on the timing of freshet and providing flood control. Flood control protection is a priority. Information is required on the timing and success of waterfowl nesting in local wetlands.

Action 1.

The effects of water management on waterfowl requires a review.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.5.5

Refer to section 11.

Bland, David. (2002).

Bland, David. (2003).

Action 2.

If necessary, mitigation measures such as the provision of floating nest platforms for loons could be implemented to reduce the impact of water level fluctuations.

Responsible Agency: MNR and OPG

Status: Incomplete

OPG has placed a few floating platforms at a few locations and expects to modify the design.

5.2.6 Mountain Chute GS to Barrett Chute GS

5.2.6.1 Madawaska River Reach 06, Issue 01: Effect of Mountain Chute Operations on Water Level Fluctuations and Walleye Spawning (WMP 2000)

Issue Description: *"Concerns have been expressed about the effect of Mountain Chute GS operations and resulting water level fluctuations on walleye spawning in the spring."*

Issue Source: Public

Response: This issue was originally studied by MNR in 1992 with the help of consultants (Tarandus, 1992). Walleye spawn downstream of the Mountain Chute GS in the spring. Based on the consultants report, OPG has provided a minimum of 100 m^3/s from 9:00 PM to 12:00 midnight to provide flow and current for walleye spawning in late April and early May since 1992. This flow provides good coverage across the tailwater channel. Water elevations are maintained within a suitable range to protect the spawning beds by the backwater effect from the Barrett Chute forebay.

The Arnprior Fish and Game Club improved the spawning shoals in the Mountain Chute tailrace in 1995/1996 with help from MNR.

Barrett Chute GS is operated during the spawning/ incubation period to keep the forebay between 200.70 - 201.17 m to ensure the spawning shoal remains covered.

Starting in 2008 OPG will provide the flow from 19:00 to 23:00 Eastern Standard Time (EST).

Action 1.

The spawning shoal will be monitored through the Walleye Watch.

Responsible Agency: MNR

Status: Ongoing

Information Need: 7.2.6.1

5.2.7 Barrett Chute GS to Calabogie GS

5.2.7.1 Madawaska River Reach 07, Issue 01: Effects of Water Level Management in Calabogie Lake on Riparians and Boaters (WMP 2000)

Issue Description: *"High water levels in Calabogie Lake contribute to flooding, ice damage and erosion of the lake's shoreline. Low water levels adversely affect boating activities."*

Issue Source: Public

Response: In 2000, the top of the Calabogie Lake operating level was lowered by 7 cm to 154.10 m to address some of the concerns related to high waters. OPG continued to have the ability to cycle up to 154.17 m. OPG is obligated to operate below 154.17 m and will still provide a buffer below the operating maximum of 154.17 m. However, this buffer will be based on the risk factors which change with time.

Flooding of buildings should not occur in areas where municipal by-laws met provincial standards including minimum setbacks from the water's edge and restricting development within the floodplain. Erosion is affected by many factors including water level, wave and wind action along with ice movement during break-up.

Refer to section 5.1.3 regarding erosion and ice damages.

Water levels on Calabogie Lake are regulated within the operating band, 153.80 -154.17 m (37 cm), through the summer period, to accommodate boating and other recreational concerns.

Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

Action 1.

No action is planned.

5.2.7.2 Madawaska River Reach 07, Issue 02: Poor Walleye Fishing in Calabogie Lake (WMP 2000)

Issue Description: *"Local residents report that walleye catches have declined in recent years. A creel survey in 1994 and recent electro fishing surveys in 1995 and 1997 conducted by MNR suggest that there may be limited or no recruitment of young walleye to the sport fishery."*

Issue Source: Public

Response: MNR stocked Calabogie Lake with juvenile walleye from shortly after the construction of the Barrett Chute GS in 1968 to 1990.

A 1998 spring trap net survey conducted by MNR as part of this review suggests that there is still a recruitment problem. Aging of samples shows that there are few young fish in the lake, but large numbers of older, mature fish indicate that the reproductive potential still exists if spawning habitat is enhanced and protected.

The Calabogie Fish and Game Club has initiated rehabilitative stocking of young walleye with some financial help from OPG. The Club has also completed a CFWIP project to improve walleye spawning habitat at the mouth of Constant Creek with help from MNR.

Action 1.

Regulation of the walleye fishery is being considered by MNR and the local community. Changes will require public input.

Responsible Agency: MNR

Status: Complete

New regulations are in place. A minimum size limit of 50 cm and a two fish limit were implemented in 1999.

Action 2.

MNR is conducting a study to correlate walleye recruitment and reproduction to the sport fishery with spring water levels/flows.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.7.1

Rehabilitation has enhanced the spawning substrate, which was identified as a limiting factor to walleye reproduction in a report on Barrett Chute.

Refer to section 11.

Pope, Gregory F. (1999).

5.2.7.3 Madawaska River Reach 07, Issue 03: Walleye Spawning at Barrett Chute GS (WMP 2000)

Issue Description: *"Although the Barrett Chute GS tailwater appears to be used by walleye for spawning, reproduction does not appear to be sufficient to maintain a walleye fishery equivalent to that prior to expansion of the station in 1968 without supplemental stocking. Spawning or egg incubation may be negatively affected by peaking flows or water level fluctuations. Water temperatures may be too low because the station draws deep water from the upstream headpond."*

Issue Source: Public

Response: The tailwater area is presently used for spawning by the Calabogie Lake walleye stock, and is believed to be potentially the most important spawning site for Calabogie Lake. Walleye have been observed aggregating over shallow habitat in the spring on both sides of the channel upstream of the boom. Eggs have also been observed after spawning. However, the available shallow spawning habitat is somewhat limited by the channel improvements that were undertaken prior to 1968 during the construction of both stations. These channels are 4 m deep downstream of the old station and 10 m deep downstream of the new station.

Flow and water level fluctuations are now controlled during walleye spawning and incubation to promote walleye spawning and protect the eggs. The spawning area in the Barrett Chute GS tailwater was increased in 1999. The new habitat was constructed below the 153.80 m minimum spring elevation of Calabogie Lake so that eggs will be protected from water level fluctuations by the backwater effect from the lake.

Local residents have reported cooling of water temperatures in the Barrett Chute tailwater during station operation, and temperature recorders established in the tailwater in 1998 confirm this phenomenon. This phenomenon is the result of the daily warming of surface waters on hot sunny days in the spring. In May, when the station is not operating, surface water temperatures in the tailwater (and any other standing water) can rise and fall as much as 4 degrees Celsius over the course of a day. However, when the station begins operation, water is drawn from the Barrett Chute headpond from a depth interval ranging from the surface to about 16 m. The mixing of the surface and deep water of the headpond lowers the temperature of the tailwater back to the mean daily temperature. This phenomenon was clearly evident in the tailwater on May 9, 1998.

The small variations in daily temperature occur when the station is operating in peak mode. This is most prominent on days with warm, sunny weather. The effect of these variations in water temperature on walleye recruitment is unknown. This effect typically occurs during walleye egg incubation and will only be noticeable in years when the peaking operation begins in early May and the spring weather is sunny and warm. This effect will not be noticeable when spring flows have high volumes well into May, due to a more constant flow of water going through the station.

Action 1.

Flow tests and observations have been made at Barrett Chute since 1996. To promote spawning success, during low freshet years, OPG will operate one small Barrett Chute unit (40 m^3/s) from 19:00 to 23:00 EST to provide current for spawning.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.7.2

OPG must comply with the conditions of the Madawaska WMP. This requirement is listed in Section 9.2.8 under the Minimum Walleye Spawn flow.

Action 2.

Calabogie Lake water levels are maintained during the spawning and incubation period for ecological and fish management (Grassy Bay, Constant Creek and Barrett Chute). The operating range is restricted to 153.80 m - 154.05 m to encourage the walleye to spawn at a lower level and avoid exposing eggs later after freshet. Once the spawning is over, the level can be raised but not lowered until the incubation period is over.

Responsible Agency: OPG

Status: Complete

OPG must comply with the conditions of the Madawaska WMP. This requirement is listed in Section 9.2.9 under the walleye spawn/incubation Maximum level.

Action 3.

MNR will study year class strength of the walleye stock relative to annual station operation.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.7.3

Action 4.

The feasibility of providing additional spawning habitat in the Barrett Chute tailwater will be investigated. The depth of Barrett Chute GS tail water was mapped in September 1998 to identify potential areas. OPG and MNR will participate in the spawning shoal project along with other partners.

Responsible Agency: MNR and OPG

Status: Complete

Rehabilitation has enhanced the spawning substrate which was identified as a limiting factor to walleye reproduction.

Information Need: 7.2.7.4

The spawning grounds were built in December 1999.

Action 5.

OPG and MNR will continue to monitor water temperature at Barrett Chute until the phenomenon is fully understood.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.7.5

Additional data collected after 2000 confirmed that the small variations in daily temperature occur when the station is operating in peak mode.

5.2.7.4 Madawaska River Reach 07, Issue 04: Spills at High Falls for Walleye Spawning (WMP 2000)

Issue Description: *"OPG should provide spills at Barrett Chute Spillway (High Falls) during the walleye spawning period. This is the original natural spawning channel. Walleye reproduction in Calabogie Lake was excellent until the Barrett Chute GS was expanded in 1968."*

Issue Source: Public

Response: The capacity of the Barrett Chute GS to discharge water was significantly increased in 1968. OPG has spilled over High Falls only for a few days on rare occasions to manage water since the expansion of the station. In 2008, spill occurred for a period of seven days due to high flows prior to the start of the spawn period. The station can pass freshet flows in almost all cases. Spilling water in the High Falls channel for the walleye spawning and egg incubation of about six weeks has an associated cost to OPG because it could have generated power. The cost of spilling 20 m^3/s for walleye spawning and incubation was considered too expensive and building additional habitat in the Barrett Chute tailwater was built instead.

Action 1.

Building additional habitat in the Barrett Chute tailwater is being investigated.

Responsible Agency: MNR and OPG

Status: Complete

The spawning grounds were built in December 1999.

5.2.7.5 Madawaska River Reach 07, Issue 05: Swimmer's Itch in Calabogie Lake (WMP 2000)

Issue Description: *"Swimmer's itch is caused by a parasite that cycles through aquatic birds and snails. Periodically, swimmers and waders, often children, are infected after swimming in Calabogie Lake. Water level fluctuations in Calabogie Lake are suspected of affecting the distribution of snails and infestation of the shallow beach areas."*

Issue Source: Public

Response: The Renfrew County and District Health Unit is unaware of a link between swimmer's itch and hydroelectric operations. The problem occurs periodically in lakes throughout the Ottawa region and elsewhere across North America, whether associated with hydroelectric operations or not. The problem is caused by cercaria, minute fork-tailed, colourless, free-swimming animals that emerge from the snail phase of the life cycle. Cercariae penetrate the skin as it dries after swimming. Since humans are unsuitable hosts, the parasites die soon after. Cercariae emerge in greatest numbers during the warmest weather when most bathing is done and are often concentrated in shallow shoreline waters when inshore winds are prevalent. The high incidence of swimmer's itch in the lakes and rivers of the upper Ottawa Valley can be explained by the abundance of certain snail species which prefer the sandy lake bottoms characteristic of the area. Information on swimmer's itch has been prepared by the Renfrew County and District Health Unit, the Ministry of Environment and University of Guelph, and can be obtained from the Renfrew County and District Health Unit in Pembroke.

Action 1.

No action is planned.

5.2.7.6 Madawaska River Reach 07, Issue 06: Calabogie Lake Water Quality (WMP 2000)

Issue Description: *"Cessation of flows from Barrett Chute into Calabogie Lake during the off-peak period causes rising water levels, stagnation and a short-term decline in potable water quality."*

Issue Source: Public

Response: Hydroelectric water management at Barrett Chute will not affect potable water quality in Calabogie Lake. As a mainstem lake (situated within the river), Calabogie Lake has a higher natural flushing rate (ratio of flow to volume) than most lakes in the region. During the summer, about the same amount of water will flow into and out of Calabogie Lake on a daily basis as would occur under natural conditions. However, when summer flows are very low, the daily flow into the lake through Barrett Chute may occur over as little as an hour. Nevertheless, flow out of the lake from the smaller Calabogie GS will likely occur over a more prolonged period, and the hourly variations in inflow and outflow that occur will not affect summer stagnation or water quality in a lake this large. In the winter, more water flows through Calabogie Lake during freeze-up than would naturally occur because of the use of storage from Bark and Centennial Lakes.

Water levels will fluctuate up to 37 cm from peaking operation at Barrett Chute GS. When elevations reach the upper limit of 154.17 m, some debris along the shorelines may be re-suspended, increasing the floating detritus in the lake.

Action 1.

No action is planned.

5.2.7.7 Madawaska River Reach 07, Issue 07: Grassy Bay Herpes (WMP 2009)

Issue Description: *"Grassy Bay is a Provincially Significant Wetland (PSW) located within the Calabogie Lake. It is approximately 440 ha in size. The wetland was almost segregated from Calabogie Lake by the creation of a causeway for the Kingston and Pembroke track before the turn of the 20th century. Grassy Bay is connected to the Calabogie Lake by two small openings (approximately 3.6 m wide) in the causeway, The openings in the causeway allow water circulation and fish movement between Calabogie Lake and Grassy Bay. Grassy Bay is home to many unique plants and animals and MNR considers the wetlands as a significant rearing and staging area for waterfowl. A few individuals have indicated there appears to be low incidences of amphibians and reptiles such as frogs and turtles in Grassy Bay. Some individuals have suggested that the 60 cm winter range on Calabogie Lake may have an adverse impact on the amphibians and reptiles which hibernate in Grassy Bay."*

Issue Source: Public

Action 1.

OPG and MNR will investigate the state of the amphibians and reptiles populations.

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.2.7.6

Action 2.

OPG will install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the winter

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.2.7.7

5.2.7.8 Madawaska River Reach 07, Issue 08: Grassy Bay Wild Rice Production and (WMP 2009)

Issue Description: *"Some individuals have suggested that in years when summer water levels are kept at the upper end of the operating band, they may be having an influence on wild rice production. The last several years we have seen little to no wild rice in Grassy Bay and therefore limited waterfowl production."*

Issue Source: Public

Action 1.

OPG will install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the summer.

Responsible Agency: OPG

Status: Incomplete

Information Need: 7.2.7.8

5.2.8 Calabogie GS to Stewartville GS

5.2.8.1 Madawaska River Reach 08, Issue 01: Mid-Day Water Levels from June to September (WMP 2000)

Issue Description: *"River use for recreation peaks in the summer months, and on a daily basis, occurs mostly between 9 A.M. and 6 P.M. When water is below the 144.50 metre (m) level, shallow areas become unswimmable. The longer that water is left at this elevation, the more significant the problem in terms of lost recreational opportunities."*

Issue Source: Public

Response: The response is divided into three parts. The first part is a brief history of the evolution of the summer range. The second part summarizes the conflict over the use of the limit from the riparian users. The third part describes the basis for the summer range because of the level, flow and energy production requirements.

A brief history of the evolution of the summer range

This issue has existed since at least the late 1970s. In August 1978, OPG tested a voluntary restriction of 30 cm on the operation of Stewartville during the summer period. The restriction was initiated by individuals with waterfront property along the Stewartville to Calabogie reach. Prior to 1978, the summer range at Stewartville was 76 cm.

The 30 cm range was based on a flow in the Stewartville to Calabogie reach of less than 53.8 m^3/s. The limit was conditional upon normal power system conditions as well as normal weather conditions. The limit evolved over the years for various reasons and interpretations of normal conditions.

In the WMP (2000), the limit was further refined to reflect the inflow conditions in the watershed during the summer tourist season. This further refinement results in an additional restriction on the entire river system which can bottle the peaking capabilities during low inflow conditions. In the past if the inflow was below the 53.8 m^3/s threshold, water could be taken out of storage at Mountain Chute, Barrett Chute and Calabogie and result in a daily average flow of more than 53.8 m^3/s, thus allowing the use of the 78 cm at Stewartville. Changing the basis of the flow threshold for 30 cm or 78 cm to the inflow calculated at Mountain Chute is a significant departure from the past which limits the operation of the entire river.

It should be noted that a 0.2 m^3/s discrepancy exists between the 1978 limit and the WMP (2000). The 2 cm discrepancy between the 1978 minimum and current minimum is due to the metrification of the level. The 1978 minimum was 472.5 ft or 144.018 m. A level of 144.00m has been used since limits were converted to metric equivalents in the 1980s.

Summary of the conflict over the limit

This issue was a source of annual debate. Whenever the operating range was restricted to the 30 cm, the inflow dependent range was considered a success. However, when the 78 cm range was used, the issue resurfaced

and initiated much discussion at the SAC meetings and a number of requests to adjust things or apply further limits or restrictions.

The interpretation of "extended period of time" when using the full 78 cm summer operating limit at Stewartville under high flows was the most contentious issue of discussion between 2000 and 2009. Many residents along the downstream end of the reach are not satisfied with the use of the full 78 cm range during daylight hours and would like to see the use below the 144.48 m restricted to the hours between sunset and sunrise, or a flat river with no fluctuations.

Operational basis for the operations

The use of the full 78 cm is required because of the following reasons:

- OPG generating stations on the Madawaska River were designed to provide power during peak periods of the day.
- Calabogie GS is the bottleneck in the system and can not pass as much water through the turbines as the other four stations.
- The operating strategy at Calabogie when flows are above 53.6 m^3/s is to pass water through the units around the clock and spill additional water during the daytime.
- There is a difference in level between the upstream face of the Stewartville dam and the downstream face of the Calabogie dam that changes with the flow conditions.

When the 78 cm range is in place, OPG passes water around the clock at Calabogie to produce as much energy as possible. However, generating energy at Calabogie results in a flow of water in the Stewartville forebay during the evening and overnight when energy demand is usually at its lowest point of the day.

Peaking stations on the Madawaska River were designed to produce lots of energy during the peak periods of the day. The electrical demand in Ontario varies from day to day and has daily, weekly and seasonal patterns. The electricity demand in the province is usually at its lowest during the middle of the night (12,000 - 13,000 MW) and can almost double at the peak of the day which is usually between 16:00 and 19:00. Weather, hours of daylight, business hours, school holidays and consumption patterns as people arrive home are the primary factors that influence the peak demand.

The water from Calabogie during the evening and overnight goes into storage at Stewartville so it can be saved for the time during the day when it has the most benefit to Ontario Electrical system. Generating units at Mountain Chute, Barrett Chute, Stewartville and Arnprior are shut down to save water for use during the day while Calabogie is left running and slowly empties Calabogie Lake overnight. Running Calabogie achieves two things. It refills Stewartville so that it can provide energy during peak hours and it empties Calabogie Lake so that energy can be produced from Barrett Chute and Mountain Chute during the day. Calabogie Lake runs in the opposite pattern as Stewartville. Running Calabogie Lake down overnight creates storage room and allows less restrictive peaking at Mountain and Barrett during the day.

To store the water that is passed through Calabogie overnight in the Stewartville forebay requires more than the 30 cm range that 144.48 m minimum provides. The 30 cm range would only allow water to be stored for approximately six hours. The 144.48 m minimum at Stewartville does not provide enough storage to move water from the lower overnight period to the peak period during the day, nor does it allow the level of Calabogie to be drained so that it can be refilled by the peaking of Mountain Chute and Barrett Chute.

It takes approximately fourteen hours to refill Stewartville from 144.00 m to 144.78 m with both Calabogie units running and no water flowing through Stewartville. The fourteen hours of storage at Stewartville allows the rest of the Madawaska System to generate electricity when the electrical demand is greatest during the day at the four other stations. Eliminating or reducing the 78 cm range when the flow is above the 53.6 m^3/s will reduce the ability of the entire Madawaska River to meet the peak demand of Ontario and shift that requirement to other river systems.

Spilling more water through the day and passing a flat flow is not an alternative because the three gates at Calabogie and the two units can not provide enough water to Stewartville, and would also produce larger water level fluctuations at the Calabogie end of the river reach. This solution would transfer the water fluctuation problem to another section of the same reach as well as limit peaking at Mountain Chute and Barrett Chute.

The threshold triggered operating range provides a compromise between recreational requirements and Ontario power system requirements. In periods of flow above 53.6 m^3/s, recreational users will experience water

level fluctuations up to 78 cm so that OPG can peak the Madawaska River. In periods of flow at or below 53.6 m^3/s, recreational users will experience water level fluctuations up to 30 cm and OPG will restrict peaking operations on the Madawaska River.

The Stewartville GS forebay is restricted to 30 cm operating range when the flow is less than 53.6 m^3/s during the summer season to improve recreational opportunities.

Restricting the range even further when flows are above 53.6 m^3/s eliminates OPG operating flexibility on the Stewartville forebay to effectively manage the generating stations on the Madawaska River and the power system. Further restrictions will increase the use of spill gates at Calabogie GS, causing more fluctuation at that location.

Refer to section 5.2.8.1 for more information about water level fluctuations between Stewartville and Calabogie.

Comments received during the review of the draft WMP 2009 indicate that residents on the reach are not satisfied with the current 30/78 cm operating range. The main area of concern regarding the summer range was that the "water level vs. flow plan needs to be revised. The single flow trigger point of 53.6 m^3/s does not adequately manage such a critical and contentious issue as water drawdown from 30 cm to 78 cm. … A flow to drawdown curve needs to be developed and documented in the 2009 plan that better meets the needs of all Reach Stakeholders."

Action 1.

OPG will provide information on operating patterns for Stewartville GS so users can take advantage of expected range of water levels. The information will be available by means of a toll-free number and the OPG Internet web site.

Responsible Agency: OPG

Status: Complete

Regular water level and flow web updates can be obtained at the following web address:

http://www.opg.com/safety/water/river/madawaska/madriver.pdf

The toll-free number is 1-888-895-1592 extension 3395.

Action 2.

OPG will add a new information need to investigate a "flow to drawdown curve".

Responsible Agency: OPG

Status: Incomplete

This issue was added to the WMP 2009 during the public review of the draft WMP.

Information Need: 7.2.8.9

5.2.8.2 Madawaska River Reach 08, Issue 02: Water Levels Adversely Affecting Boating and Shoreline Activities (WMP 2000)

A. Docks and Shoreline Structures

Issue Description: *"When water levels at the Stewartville GS forebay are reduced to approximately 144.00 m, docks and boating activities are adversely affected."*

Issue Source: Public

Response: The compromise documented in section 5.2.8.1 is part of the evolution of this issue since the late 1970s. Alternative dock systems (e.g. floating, cantilevered), as opposed to fixed dock systems, are recommended to help deal with water level fluctuating problems. Refer to section 5.1.9.

If the inflow calculated at Mountain Chute GS is less than 53.6 m^3/s, then the Stewartville forebay is limited to 144.48-144.78 m (0.30 m).

If the inflow calculated into Mountain Chute GS and passed through the river is greater than 53.6 m^3/s, the Stewartville forebay is limited to 144.00-144.78 m (0.78 m).

If the 0.78 m range is in use, the generating units at Calabogie GS are to be scheduled to ensure the Stewartville forebay level rebuilds on a daily cycle. This will usually result in a peak level above 144.48 m by 06:00 to 08:00 AM and a level close to 144.00 m by 20:00 to 24:00.

Action 1.

The threshold for the use of the 78 cm range will be based on the inflow into Mountain Chute.

Responsible Agency: OPG

Status: Complete

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.10 lists the constraints and conditions that OPG must follow for Stewartville.

B. Boating Safety

Issue Description: *"When water is released at Calabogie GS, the higher level of this section of the river creates a strong current, leaving canoes and boats caught downstream, unable to return to their point(s) of origin."*

Issue Source: Public

Response:

Alarms have been suggested to notify users of flow changes. A siren sounds prior to the opening of one of the three spill gates at Calabogie.

Action 1.

Signs will be put at additional access points to the river to ensure users are aware of potential water level fluctuations. The PAC will identify sites.

Responsible Agency: OPG

Status: Complete

OPG has increased the signage on the river at the dam. PAC members did not identify the location of the sites.

Action 2.

Calabogie GS spill gates operate in an open or closed position. Gate operation will be reviewed to determine if partial operation is possible.

Responsible Agency: OPG

Status: Incomplete

Information Need: 7.2.8.2

5.2.8.3 Madawaska River Reach 08, Issue 03: Privatizing OPG and Future Water Level Regulation (WMP 2000)

Issue Description: *"In light of the real possibility the generating arm of Ontario Power Generation may be privatized, it is of concern that 50-year old regulations, allowing water level fluctuations of up to 2 m (7 feet), would be detrimental to the Stewartville Reach of the river. Consequently, urgent attention needs to be given to updating the regulations to 0.6 m (24 inches) in the winter, and 0.3 m (12 inches) in the summer, in order to reflect current ecological, social and environmental considerations."*

Issue Source: Public

Response: The issue of privatization of OPG assets is discussed in the generic issues section 5.1.6, because it is an issue that potentially impacts all reaches of the river.

OPG has revised the operating directive for Stewartville forebay during the summer period, so that it is a function of supply conditions. The forebay is limited to a 30 cm range in dry conditions and 78 cm under wetter conditions.

Stewartville GS water level fluctuations normally do not exceed 1 m outside of the summer period. A lower operating limit of 143.50 m outside the summer period but with potential excursions below it during energy shortages would resolve most concerns.

Action 1.

OPG to follow up with a directive voluntarily limiting the bottom of the operating range to 143.50 m from Thanksgiving weekend to April 1.

Responsible Agency: OPG

Status: Complete

This limit is no longer a voluntary limit. OPG must comply with the conditions of the Madawaska WMP. Section 9.2.10 lists the constraints and conditions that OPG must follow at Stewartville.

5.2.8.4 Madawaska River Reach 08, Issue 04: Shoreline Erosion (WMP 2000)

Issue Description: *"A short section of shoreline with clay soils approximately 100 m east of the bridge at Burnstown is steep and eroding badly. The eroded material reduces water clarity and contributes to floating debris. Other nearby sites are exhibiting erosion problems as well, including a section of shoreline approximately 100 yds. west of the Ministry of Transportation (MTO) picnic area (Cherry Beach) along County Road 508."*

Issue Source: Public

Response: Erosion is a natural process which occurs in regulated and unregulated river systems. Erosion in this reach of the river may potentially damage banks and shoreline structure, but is expected to have little effect on water clarity and does not pose a threat to fish habitat. Refer to section 5.1.3 for a more detailed explanation about erosion.

Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

Action 1.

Refer the erosion issue to the internal OPG review process

Responsible Agency: OPG

Status: Incomplete

5.2.8.5 Madawaska River Reach 08, Issue 05: Minimum Flow Requirements for Walleye Spawning in North Channel of River Calabogie GS (WMP 2000)

Issue Description: *"During spring freshet, water may be spilled down the North Channel to facilitate walleye spawning. In some years, flows have been sufficient to attract spawning fish, and then these flows have been dropped prior to the eggs incubating and hatching. Flows have been minimized in some years to prevent spawning from occurring in the channel. Attempts are being made by MNR and OPG to assess the minimum flows required to cover the spawning substrate. High flows during spring freshet cover sections of river bed that are not suitable for spawning."*

Issue Source: Public

Response: During high flow periods like spring freshet, OPG needs to be able to spill water through the North Channel to maintain water control in the river system. OPG prefers to spill water in the North Channel because spill in the South Channel reduces the capacity of the three automated sluice gates and the generating station.

MNR and OPG have performed a series of flow tests in 1996-98 and have developed a strategy for managing flow in the North Channel. Information Needs Study 7.1.2 and 7.2.8.1 were utilized to develop the WMP 2000 requirements. (MNR and Ontario Hydro, 1997; Pope, Gregory F., 1999).

The strategy was modified in 2008 to focus more water in the South Channel.

- OPG can spill as needed prior to spawning.
- Spill 5 m^3/s in the North Channel during the spawning and incubation period.
- Increase spill in the North Channel to pass more water if required.

Action 1.

Inform local interested parties of water management for walleye spawning in the North Channel (Calabogie Fish and Game Club, Walleye Watch participants).

Responsible Agency: MNR

Status: Complete

Action 2.

South Channel spawning shoals are to be assessed for usefulness and spawning success.

Responsible Agency: MNR and OPG

Status: Complete

Information Need: 7.2.8.2

Refer to section 11.

Pope, Gregory F. (1999).

Rosein, Darwin (1999a).

Rosein, Darwin (1999b).

Action 3.

Determine if there is a backwater effect from Stewartville on the South Channel. The spawning shoal has to be below the minimum water level from backwater effect.

Responsible Agency: OPG

Status: Ongoing

Information Need: 7.2.8.3

Action 4.

OPG will write an operating procedure for North Channel water management. A report of 1998 test results complete with photographs will be issued (Mar/99).

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.8.4

Refer to section 11.

MNR and Ontario Hydro (1997).

Pope, Gregory F. (1999).

Rosein, Darwin (1999a).

Rosein, Darwin (1999b).

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.9 lists the constraints and conditions that OPG must follow for Calabogie GS.

5.2.8.6 Madawaska River Reach 08, Issue 06: Effects of Low Flows in the North Channel of the River at Calabogie GS on Boating (WMP 2000)

Issue Description: *"The North Channel cannot be used for kayaking and canoeing when flows there are reduced to the summer minimum of 0.85 m^3/s. This loss of opportunity has a potential economic impact."*

Issue Source: Public

Response: An individual has requested 15 m^3/s flow during the summer for kayaking and canoeing. Flow tests conducted in the spring of 1996 by OPG indicated that 15 m^3/s would provide a short stretch of rapids at the extreme upper end of the rapids below the control structure, and would be suitable for kayaking, but that it would not be navigable for most canoeists.

Providing sufficient flows for kayaking and canoeing is economically prohibitive for OPG when the cost of additional log operations and lost energy from the Calabogie GS are considered. There is no demonstrated economic activity related to boating on the North Channel at the present time. Refer to Hagler Bailly, (1999) for more information.

Action 1.

Should an economically viable proposal be advanced, OPG would consider it.

Responsible Agency: OPG

Status: Complete

5.2.8.7 Madawaska River Reach 08, Issue 07: Limiting Factors to Production of Walleye, Pike, Muskellunge etc. (WMP 2000)

Issue Description: *"Large water level fluctuations during the spring spawning period adversely impact fish populations in some reaches (e.g. Springtown Marsh, Cherry Beach)."*

Issue Source: Public

Response: OPG has taken action to protect pike and muskellunge spawning conditions by putting a new lower limit of 144.00 m on the Stewartville GS forebay beginning April 1 of each year. The operating restriction remains in place until the summer level restriction comes into force on the May long weekend. By this time, spawning has occurred. Moderate water level fluctuations are not a threat.

Action 1.

Spring surveys will be conducted of fish spawning habitat at Springtown Marsh and Cherry Beach rapids. The survey will be used to identify limiting factors to successful reproduction in these areas when spring river flows permit.

Responsible Agency: MNR

Status: Ongoing

Information Need: 7.2.8.5

In April 1999, walleye were observed to spawn in the upper part of the Cherry Beach rapids (Rosien, 1999). During low flow springs such as 1999 and 2001, the shoal associated with the rock crib may become exposed during either spawning and/or incubation. Some observations by Rosien (1999) and MNR (Boos personal communication 1999) suggest that walleye spawn between the shoal and the north bank where eggs are unlikely to be exposed. However, the SAC requested confirmation that there was no egg exposure problem at this location, and an investigation into the level of protection by the backwater from Stewartville GS if higher elevations are maintained during the spawning/incubation period. Three new action items where identified in April 2002 to resolve this issue.

Action 2.

Continue to make annual observations of the distribution of spawning walleye at Cherry Beach when flows permit. Make observations of shoal exposure at various flows through direct observation and flow tests. (First flow test, 68 m^3/s, conducted Jan 30, 2002 by OPG). During egg incubation during low spring flows, inspect shoal for exposed eggs.

Responsible Agency: MNR and OPG

Status: Ongoing

Information Need: 7.2.8.6

Action 3.

At low flows, determine how far upriver the backwater from the Stewartville Generating Station extends relative to the Cherry Beach rapids at elevations 144.48 to 144.78 m.

Responsible Agency: OPG

Status: Ongoing

Information Need: 7.2.8.7

Acton 4.

At low summer flows, inspect the shoal to determine if the elevation of the shoal can be easily lowered to prevent dewatering.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.8.8

In 2002, the flows were too high to observe spawn conditions (Action Item #2). Low flow conditions were observed (Action Item #4) and it was decided that OPG would lower the elevation of the upstream shoal (Action Item #5).

Action 5.

Lower the elevation of the shoal upstream of Cherry Beach to prevent the possibility of dewatering the potential spawning ground.

Responsible Agency: OPG

Status: Complete

Remediation of the shoal upstream of Cherry Beach was completed in the fall of 2003. Remediation of the shoal just downstream of Cherry Beach is still required.

Action 6.

Lower the elevation of the Shoal downstream of Cherry Beach to prevent the possibility of dewatering the potential spawning ground.

Responsible Agency: OPG

Status: Incomplete

5.2.8.8 Madawaska River Reach 08, Issue 08: Bass Spawn and Baitfish (WMP 2009)

Issue Description: *"Once the docks were in the water and sometime between late spring and early summer when my children were much younger I can remember them standing on the ramp between the shoreline and the floating dock to watch bass spawn. With the widely fluctuating water levels it no longer seems to happen."*

"Current water management does not support spawning needs of bass and bait fish."

Issue Source: Public

Response: Based on previous experience, evidence suggests that the bass and baitfish population have adapted to the 78 cm range over the last 30 years and that the 2009 plan does not hinder the spawning needs of these fish. On average the 78cm range has been used from April through to mid-to-late June when bass are off their nests. Likely they have adapted to this fluctuation and build their nests deeper similar to areas on the Ottawa River where similar peaking have resulted in this adaptation. However MNR is open to investigating with the assistance of the local residents of the Stewartville reach to help determine if impacts exist.

Action 1.

A new information need will be added to the WMP 2009 to investigate if impacts to the bass and baitfish populations exist on the Stewartville Reach.

Responsible Agency: MNR

Status: Incomplete

This issue was added to the WMP 2009 during the public review of the draft WMP.

Information Need: 7.2.8.10

5.2.9 Stewartville GS to Arnprior GS

5.2.9.1 Madawaska River Reach 09, Issue 01: Fish Populations in Tributaries of Lake Madawaska (WMP 2000)

Issue Description: *"Lack of information on the use of tributaries that flow into Lake Madawaska (e.g. Waba Creek) by fish for spawning purposes and the relative contribution of these areas to the fish populations."*

Issue Source: Public

Response: A detailed assessment of Lake Madawaska fish stocks was conducted by OPG in 1977 a year after creation of the reservoir. Additional surveys have been conducted by MNR and the Arnprior Fish and Game Club in 1985 and 1988.

Lake Madawaska walleye and other species have been observed to spawn in the Stewartville GS tailwater but the use of other tributaries is unknown. The PAC recommends regular assessments of this reach and others in the watershed with public access to the results (see Information Needs Section).

The Arnprior Fish and Game Club observed walleye spawning at the mouth of Waba Creek. The observations of the Arnprior Fish and Game Club are part of the Walleye Watch programs. They applied for a permit (1998) to build a spawning bed on Waba Creek.

Action 1.

Under MNR supervision, conduct preliminary studies using local fish and game club members, property owners, etc. to determine extent of use of tributaries for spawning.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.9.1

The target fish species is walleye. This was accomplished through the local "Walleye Watch" program.

Action 2.

Assessment reports will be distributed to the public on request.

Responsible Agency: MNR

Status: Ongoing

Public requests for copies of reports and assessments are met.

Action 3.

Develop a Walleye Watch program for the Lake Madawaska tributaries.

Responsible Agency: MNR

Status: Complete

The Arnprior Fish and Game Club has a "Walleye Watch" program which covers the tributaries.

Action 4.

MNR will conduct periodic assessments to establish age class data on walleye for assessing recruitment and the success of annual reproduction.

Responsible Agency: MNR

Status: Ongoing

Information Need: 7.2.9.2

5.2.9.2 Madawaska River Reach 09, Issue 02: Efficiency of Rehabilitation Work on Walleye Spawning Beds and Effect of Flow Management (WMP 2000)

Issue Description: *"Under MNR's Community Fisheries and Wildlife Involvement Program (CFWIP), the Arnprior Fish and Game Club has worked over a number of years with MNR to rehabilitate and establish new spawning beds for walleye below the Stewartville GS. "Walleye Watchers" have monitored the number of walleye spawning on shoals each year. However, walleye reproduction success as a function of spring peaking operations and water level fluctuations and the contribution to the Lake Madawaska stock is not known."*

Issue Source: Public

Response: The Lake Madawaska assessment study referenced in the Information Needs Document will provide data on walleye recruitment success. An operating guideline for walleye spawning has been developed and verified in 1997 for Stewartville GS to enhance walleye spawning. The WMP (2009) requirements have been adjusted to provide a minimum flow requirement of 45 m^3/s for an additional hour per day. Refer to section 9.2.10 for flow requirements during the spawn. Flow requirements are documented in Information Needs Study by Pope, Gregory F. 1999.

- During low flow freshet, operate one small unit (45 m^3/s) from 19:00 to 23:00 EST during walleye spawning.
- Turning units off at the station will be staged in 10 minute increments to keep the spawning shoal covered.

Action 1.

Guidelines will be reviewed and modified based on further assessment and results of Walleye Watch.

Responsible Agency: OPG

Status: Complete

Information Need: 7.2.9.3

OPG must comply with the conditions of the Madawaska WMP. Section 9.2.10 lists the constraints and conditions that OPG must follow for Stewartville GS.

5.2.9.3 Madawaska River Reach 09, Issue 03: Effect of Testing the Stewartville GS Spillway on Fish Spawning Shoal (WMP 2000)

Issue Description: *"The new spawning shoal constructed below the Stewartville GS is immediately downstream of the emergency spillway. The spillway would be used in the event of flooding or other emergency conditions. The location of the shoal may prevent OPG from being able to periodically test the working condition of the mechanical sluices."*

Issue Source: Public

Response: The gates will be partially tested at the start of freshet. A full test will be conducted every five years after spawning and incubation has been completed.

Action 1.

MNR will do an elevation profile of the spawning bed at Stewartville prior to a full test of the spillway to document existing conditions, and then again after the full test to determine if further rehabilitation work is required.

Responsible Agency: MNR

Status: Complete

Information Need: 7.2.9.4

A full spill test was completed. Some rock movement was observed but the shoal remained intact. If a flood release is required, rehabilitation work will probably be necessary.

Action 2.

Any adverse impacts on installed spawning shoals under 'emergency' conditions will be repaired by OPG.

Responsible Agency: OPG

Status: Ongoing

Action 3.

MNR will be notified by OPG of any spill in order to assess the spawning shoal.

Responsible Agency: OPG

Status: Ongoing

5.2.9.4 Madawaska River Reach 09, Issue 04: Deterioration of Existing Shoreline Erosion Protection Works along Lake Madawaska (WMP 2000)

Issue Description: *"Protection works in need of repair on residential lands fronting on Lake Madawaska."*

Issue Source: Public

Response: Some of the marine clay banks have been repaired by installing rip-rap protection to reduce erosion. The area is surveyed periodically by OPG with repairs programmed to ensure private landholders are not affected.

OPG carried out shoreline stabilization work on the Arnprior forebay during 2001 and 2002. This shoreline work covered over 2200 m of the shoreline and included placing rock fill along the toe of the banks, re-grading portions of the banks, and planting trees. Fish habitat features included the installation of large woody debris structures, gravel fans and gravel pads. The shoreline work was monitored for success during both 2003 and 2004 and subsequent shoreline tree planting continued in 2005 to further stabilize a few observed problem areas.

Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

Action 1.

The erosion control program is ongoing.

Responsible Agency: OPG

Status: Ongoing

5.2.10 Arnprior GS to Ottawa River

5.2.10.1 Madawaska River Reach 10, Issue 01: Effect of Fluctuations in Water Flows on Fish Populations (WMP 2000)

Issue Description: *"Walleye from the Ottawa River are known to spawn below the weir below the Arnprior GS dam, and lake sturgeon are suspected to spawn in the area as well. It is believed that the backwater effect from the Ottawa River (Chats Falls GS operation) covers the spawning beds; the impact of fluctuations in water flows on spawning is not known."*

Issue Source: Public

Response: Walleye spawning beds were installed by OPG downstream of the weir below Arnprior GS in 1976 when the station was constructed. Chats Lake (Ottawa River) water levels control the levels in this reach. OPG has not received any concerns since water levels in Chats Lake rise with spring freshet and cover the spawning bed.

Prior to 2000, the Arnprior Fish and Game Club was contacted and did not have any concerns about the operation of Arnprior GS and spawning bed coverage downstream of the weir. In 2006 Arnprior Fish & Game

Club observed a number of fish up along the rip rap section of the bank and on the exposed rock just down stream of the weir. The shoal area near the bank also becomes de-watered once the flow over the weir stops.

Action 1.

MNR and the local fish and game club will continue to monitor the area.

Responsible Agency: MNR

Status: Ongoing

This is being done on a regular, annual ongoing basis ("Walleye Watch" is an annual example).

Action 2.

OPG and MNR will investigate the problem and determine the importance of the shoal.

Responsible Agency: MNR and OPG

Status: Incomplete

Information Need: 7.2.10.1

5.2.10.2 Madawaska River Reach 10, Issue 02: Flow Regulation to Dilute Effluent from the Town of Arnprior Water Pollution Control Centre (WPCC) (WMP 2000)

Issue Description: *"To ensure effluent from Arnprior WPCC is diluted to meet Ministry of the Environment (MOE) Provincial Water Quality Objectives, OPG discharges 212.4 m^3/s for one hour, with no two consecutive discharges more than 24 hours apart. This WPCC is currently being upgraded."*

Issue Source: Public

Response: A minimum flow at Arnprior GS to dilute and flush out effluent from the section of the river below the weir has been in place since 1979. OPG continues to pass the required flow until further evaluation work is completed. The Town of Arnprior is currently involved in a process to review options for the expansion of the WPCC. MOE and the Town of Arnprior are discussing the options for the discharge of the effluent.

The Town of Arnprior did inquire about the possibility of a continuous flow from Arnprior GS to meet the effluent dilution requirements. However, Arnprior and the rest of OPG hydroelectric facilities on the Madawaska River were not designed to provide a continuous minimum flow.

Action 1.

No action is planned.

5.2.10.3 Madawaska River Reach 10, Issue 03: Flow Regulation to Facilitate Boating and Docking at Chats Lake Yacht Club and Marina (WMP 2000)

Issue Description: *"High flows from the Arnprior GS make boating and docking at the marina and yacht club difficult."*

Issue Source: Public

Response: OPG is required to limit the operation of Arnprior GS to one unit from May long weekend to Labour Day, to avoid high velocities downstream and making docking difficult at the Marina and Yacht Club. Arnprior GS has two generating units. The second unit is operated if there is more water than one unit can pass in 18 hours or during an energy shortage. The 18 hour is a reduction from 24 hours due to the potential of spilling water during the low energy demand periods in the early hours of the day.

Refer to section 9.2.11 for more information.

Action 1.

Advise other marina operators of Arnprior GS summer operating rules.

Responsible Agency: OPG

Status: Complete

5.2.10.4 Madawaska River Reach 10, Issue 04: Shoreline Erosion (WMP 2000)

Issue Description: *"Eroding shorelines on residential properties."*

Issue Source: Public

Response: Erosion is a natural process which occurs in regulated and unregulated river systems. OPG does limit the flow to a single unit operation during the summer period which may reduce the velocity and potential erosion. However, the unit limitation was established to reduce velocities for recreational boating. Refer to section 5.1.3 for more information on erosion.

Concerns about erosion-related complaints and issues related to OPG hydroelectric facilities or dams should be directed to First Line Manager Operating Ottawa\ Madawaska at (613) 432-8878, ext. 3315.

Action 1.

No action is planned.

5.3 OPEONGO RIVER

The 2009 plan incorporates all dams and generating stations in the Madawaska River Watershed and as such the Opeongo River Tributary is new to the plan. This tributary contains five MNR-owned control structures and one privately-owned dam.

Issues specific to the Opeongo River Tributary were solicited by the public and other stakeholders during the public consultation process for the draft plan. No issues are identified during the consultation process. Please refer to section 4.2 for additional information on the specific structures.

5.4 YORK RIVER

The 2009 plan incorporates all dams and generating stations in the Madawaska River Watershed and as such, the York River Tributary is new to the plan. This tributary contains nine dams of which MNR owns eight and BLP owns one GS. The York River Tributary includes dams along the York River and the Little Mississippi River. Please refer to section 4.3 for additional information on the specific structures.

Issues specific to the York River Tributary were solicited by the public and other stakeholders during the public consultation process for the draft plan. No issues were identified during this process.

5.5 WABA CREEK

5.5.1 Waba Creek Reach, Issue 01: Issue Minimum Flow Requirement (WMP 2009)

Issue Description: *"The White Lake Dam Operation Plan 1997 did not include a provision for a continuous minimum flow through the dam."*

Issue Source: MNR

Response: The establishment of a 0.14 m^3/s (5 cfs) minimum flow was a mandatory change to the 1997 White Lake Dam Operation Plan and is reflected in the updated 2007 operation plan. Legislation dictates that a continuous minimum flow must be passed through this dam to ensure a sufficient flow is discharged into Waba Creek.

The minimum flow will be achieved by placing a notch between the 2nd and 3rd log of the middle stop log bay. The opening size and location of the notch will not compromise public safety. Field testing during a low flow period will be required for Waba Creek.

Action 1.

MNR will conduct field tests to verify if the notch is adequately sized to pass the required flow of 0.14 m^3/s.

Responsible Agency: MNR

Status: Incomplete

Information Need: 7.5.1

5.5.2 Waba Creek Reach, Issue 02: Change in Water Level Measurements from Inches to Tenths of a Foot (WMP 2009)

Issue Description: *"The 1997 Operation Plan used a 3 inch above and below margin. The water level gauge at the dam indicates measurements in feet, however, the increments are in tenths of a foot."*

Issue Source: MNR

Response: The White Lake Dam has been operated in tenths of a foot since the Operation Plan was first put in place.

To facilitate both MNR and the public when reading the gauge at the dam, the Dam Operation Plan 2007 and WMP 2009 will reference tenths of a foot. The 3 inch margin is now referred to as the 0.3 ft margin.

Action 1.

MNR will adopt a 0.3 ft tolerance around water level targets in the WMP for the White Lake Dam instead of a 3 inch margin.

Responsible Agency: MNR

Status: Complete

Changes incorporated into section 9.5.1.

5.5.3 Waba Creek Reach, Issue 03: Issue Rule Curve Deviations, Over-Winter Target Level (WMP 2009)

Issue Description: *"Natural variations in water levels occur all year long and the White Lake Dam Operation Plan (1997) did not completely allow for natural variations during the winter as the fluctuation allowance was in place for target levels above 3.5 feet and not below it."*

Issue Source: MNR

Response: MNR underwent a public consultation process in January 2007 to solicit feedback on a potential change to the over winter target level for the White Lake Dam. Public feedback received was receptive to this change and is incorporated in the White Lake Dam Operation Plan (2007).

The Updated Operating Plan identifies target levels which are a best management practice. MNR's objective is to maintain the water levels as closely as possible to the target levels. Target levels are subject to a fluctuation allowance, 0.3 feet above and below the target level, to allow for human-caused influence or weather-related factors such as evaporation, drought and heavy rainfall events. As a result, slight variations above or below the target level may occur.

Action 1.

MNR will adopt a 0.3 ft tolerance around water level targets in the WMP

Responsible Agency: MNR

Status: Complete

Changes incorporated into section 9.5.1.

5.5.4 Waba Creek Reach, Issue 04: Facilitate Pike Spawning (WMP 2009)

Issue Description: *"If possible, to help the facilitation of pike spawning by filling earlier in spring."*

Issue Source: MNR

Response: MNR underwent a public consultation process in January 2007 to solicit feedback on a proposed amendment to the 1997 Operation Plan that would attempt to achieve the May 1st Target Level by April 15th. Due to favourable comments received during this process, the 2007 Operation Plan and WMP 2009 outlines that depending on the timing of the spring freshet (snow melt, ice off lake), attempts will be made to attain this level to facilitate pike spawning. The earlier fill will be subject to spring conditions each year.

Action 1.

Continue to monitor each year timing of freshet target level by April 15th if conditions exist.

Responsible Agency: MNR

Status: Ongoing

Changes incorporated into section 9.5.1.

5.5.5 Waba Creek Reach, Issue 05: Increase to Target Level for Power Production (WMP 2009)

Issue Description: *"Prior to the 1997 Operation Plan, the upper target level for May was 5.2 ft; however, it was lowered to 5.0 ft in the 1997 plan. A request from the waterpower producers on Waba Creek was made to increase the target level for May to 5.2 ft to allow for additional power production."*

Issue Source: Fraser Power, Misty Rapids Power, Barrie Small Hydro

Response: There was no indication that that change from a target level of 5.2 to 5.0 ft had any favourable impact to property owners on White Lake in terms of a decreased potential for flooding and erosion.

MNR underwent a public consultation process in January 2007 to solicit feedback on this proposed change to the Operation Plan. The proposed change to the target level received no negative feedback and as result, the change to the target level to 5.2 ft for the month of May has been made. Please refer to section 9.5.1.

Action 1.

Change to the target level to 5.2 ft for the month of May.

Responsible Agency: MNR

Status: Complete

Changes incorporated into section 9.5.1.

5.6 OTHER TRIBUTARIES

The 2009 plan incorporates all dams and generating stations in the Madawaska River Watershed and eight dams have been identified that flow into the main stem of the Madawaska River. Please refer to section 4.5 for additional information on the specific structures.

Issues specific to dams on other tributaries were solicited by the public and other stakeholders during the public consultation process for the draft plan. No issues were identified during this process.

6 KEY GAPS

The purpose of this chapter is to identify key issues from section 5.0 that require further study or analysis to fill information gaps in order to:

- gain a better understanding of the river ecosystem
- define the issues relative to hydroelectric operations
- determine options for mitigation.

A total of 38 of the 54 information needs identified in the issues sections have been completed. Seven new information needs were added between 2000 and 2009. Nine information needs are incomplete and seven information needs are still ongoing. Ongoing information needs are listed in Table 6.01. Incomplete information needs are listed in Table 6.02. The incomplete and ongoing information needs represent key information gaps.

Tables 6.01 and 6.02 list the following:

- the Issue
- Action Item
- Information Need
- Agency
- Information Need reference number from section 7 and the WMP source
- the assigned priority (high, medium or low)

The criterion for a high priority classification were:

- a high probability that the information need could be used as a basis for mitigation/compensation

or

- a significant negative impact or limitation requiring investigation into the possible cause or link to the level and flow regime.

The criterion for a medium priority classification were:

- a reasonable probability that the information need could be used as a basis for mitigation/compensation

or

- a potential negative impact or limitation requiring investigation into the possible cause or link to the level and flow regime.

The criterion for a low priority classification were:

- unlikely that the information need could be used as a basis for mitigation/compensation

or

- no real negative impact or limitation requiring investigation into the possible cause or link to the level and flow regime.

Table 6.01: Incomplete Information Needs

Priority	Issue #	Action #	Information Need	Agency	WMP Source
high	5.2.4.4	1	**7.2.4.3: Information on Walleye Downstream from Palmer Rapids to Griffith:** Assessing the current state of the walleye population will permit the development of regulations to enhance and protect the existing fish population. There is a high probability that the information could be used as a basis for mitigation.	MNR	2000
high	5.2.10.1	2	**7.2.10.1: Effect of Fluctuations in Water Flows on Fish Populations – Shoal Near North Bank:** Observation and monitoring of the area would allow the identification of potential problems and permit the development of possible mitigation. The dewatering of fish eggs is considered a significant negative impact requiring further monitoring.	MNR OPG	2000
high	5.2.8.1	2	**7.2.8.9: Stewartville flow to rule curve:** Develop a “flow to rule curve” for the reach and assess the potential impact of the “curve” on flows and levels in the Stewartville reach as well as the implication on energy production at OPG’s five facilities. There is a reasonable probability that the information could be used to adjust existing limits.	OPG	2009

Table 6.01: Incomplete Information Needs Continued

Priority	Issue #	Action #	Information Need	Agency	WMP Source
medium	5.5.1	1	**7.5.1: Waba Creek - Minimum Flow Requirement:** A required minimum flow of 0.014 m^3/s is to be passed through the White Lake Dam. Field testing will determine if the notch is adequately sized. There is a potential negative impact if the flow is lower than expected.	MNR	2009
medium	5.2.7.7	1	**7.2.7.6: State of Grassy Bay Herpes:** The state of amphibians and reptiles in Grassy Bay is unknown. Determining if anecdotal observations are consistent with quantitative information is the first step in quantifying a potential negative impact related to the level and flow regime of the reach. There is a potential negative impact related to the degree of water level fluctuations.	MNR OPG	new
medium	5.2.7.7	2	**7.2.7.7: Water Fluctuations During the Winter in Grassy Bay:** Quantitative information on the level regime of Grassy Bay will assist in quantifying a potential negative impact.	OPG	new
medium	5.2.7.8		**7.2.7.8: Grassy Bay Wild Rice Production:** Quantitative information on the level regime of Grassy Bay will assist in quantifying a potential negative impact.	OPG	new
medium	5.2.4.6	1	**7.1.12: Palmer Rapids Dam Minimum flow requirement:** Assessing the impact on the level at Bark Lake and Kamaniskeg Lake versus the impact of the higher flows though Palmer Rapids. There is a reasonable probability that the information could be used to adjust existing limits.	OPG	2009
low	5.1.25/ 5.2.3.5	1/1.2	**7.1.7: Review operation of Baptiste Lake:** There is no pressing known negative impact or limitation requiring investigation. However, the review would analyze the existing data to quantify the relationship between Baptiste Lake and Kamaniskeg Lake. From there, potential options could be identified. It is unlikely that the information need could be used as a basis for mitigation or compensation.	MNR OPG	2000
low	5.2.8.8	1	**7.2.8.10: Stewartville Bass and baitfish:** Investigate if the 30/78 cm has an impact on the Bass and baitfish populations in the Stewartville Reach. It is unlikely that the study will be used as a basis for mitigation/compensation because previous experience on other systems suggests that the bass and baitfish population will have adapted to the 78 cm range and the WMP 2009 does not hinder the spawning needs of these fish.	MNR	2009
low	5.2.1.2	1	**7.2.1.2: Hydraulic Conditions - Rapids near the Town of Madawaska:** There is no real negative impact or limitation requiring investigation. However a study can determine if water levels in the upper river are controlled by the Bark Lake Dam or by the rapids at the Town of Madawaska. It is unlikely that the information need could be used as a basis for mitigation or compensation.	OPG	2000
low	5.2.8.2	2	**7.2.8.1: Calabogie Gate operation:** There is no real negative impact or limitation requiring investigation.	OPG	2000

Table 6.02: Ongoing Information Needs

Priority	Issue #	Action #	Information Need	Agency	WMP Source
high	5.2.8.5	3	**7.2.8.3: Assessment of the South Channel Spawning Shoals and Determination of Backwater effect of Stewartville GS:** The dewatering of fish eggs is considered a significant negative impact requiring further monitoring.	OPG	2000
high	5.2.8.7	2	**7.2.8.6: Cherry Beach Observations:** The dewatering of fish eggs is considered a significant negative impact requiring further monitoring.	MNR OPG	new
medium	5.1.2	1	**7.1.2: Periodic angler creel surveys:** Angler surveys may identify a limitation requiring investigation into the possible cause or link to the level and flow regime.	MNR	2000
medium	5.2.8.7	3	**7.2.8.7: Cherry Beach backwater:** Followup monitoring on existing mitigation measure may identify a potential limitation requiring investigation.	OPG	new
medium	5.2.9.2	4	**7.2.9.2: Fish Populations in Tributaries of Madawaska Lake:** Followup monitoring on existing populations may identify a potential limitation requiring investigation.	MNR	2000
low	5.1.15	2	**7.1.4: Visitor's Survey:** Useful information is generated from Vistors Survey. However, it's unlikely that the information could be used as a basis for mitigation or compensation.	MNR OPG	2000
low	5.1.1	2	**7.1.1: Additional Biological and Ecological Information:** It is useful to gather additional information. However, individual information needs are more likely to be used as a basis for mitigation or compensation.	MNR OPG	2000

7 INFORMATION NEEDS

This section contains the completed or pending information needs associated with this plan. Information needs represent gaps in the knowledge base on an issue. Issues are usually limited to effects of water management activities on the natural environment. Needs in this section are derived from the Issues Section (5.0). Information Needs may be fulfilled by observations without a formal study or through a formal study documented in a published report. A study is usually carried out to address one or more information needs. The intent of this usually involves at least one of the following:

- gain a better understanding or the river ecosystem
- define the issues relative to hydroelectric operations
- determine options for mitigation and or compensation

Completed Information Needs will have one of two results:

- further study will be required to assess the concerns or issues, or
- an action is recommend to address the concern or issue

Reports document any studies carried out to address one or more Information Needs. All completed and pending reports are referenced in this section and are available to the public on request. This section has been organized on a reach basis similar to the Issues and Solutions section (Section 5.0).

The information needs continue a long history of work on the river conducted by MNR and OPG. For example, MNR commissioned a consultant study of OPG's effects on walleye spawning at three sites in 1992. MNR initiated the Walleye Watch with the participation of local fish and game clubs and other user groups to monitor spawning success along the river. OPG conducted environmental studies on the river in the 1970s in conjunction with the development of the Arnprior GS, and again in the late 1980s for the proposed redevelopment of the Calabogie GS.

The knowledge gained from the investigations of an information need is used to provide answers to issues and concerns raised through the course of the water management review. The information needs continued to expand during the 2000 to 2009 period. A number of studies were completed and new studies were identified during the first term of the plan (2000-2009). Some of the identified studies are in an earlier stage of development and will be subject to revision based on public input and methodological constraints.

A list of the information needs is summarized in Table 7.01. The title of the information need, issue number(s) and status are also summarized in Table 7.01. The issue numbers from section 5.0 are also listed in table 7.01. Three items that appeared in the Information needs section of the WMP (2000) have been removed because they were action items rather than information needs. All three items were completed. The three removed items are

- Erosion workshop
- Portage routes
- Floating dock

There are a total of 54 information needs. The 36 of information needs have been completed, eight are ongoing and ten are incomplete. Seven new information needs were added since the WMP 2000 was published. Studies that were carried out between 1995 and 2008 often group many information needs items together.

7.1 GENERAL NEEDS

Information Needs in this sub-section involve more than one reach.

7.1.1 Additional biological and ecological information

Tributary: Madawaska River

Reach: 1-10

Issue #: 5.1.1 and 5.1.24

Action Item #: 2

Agency: All

Status: Ongoing

Purpose: Collect additional biological and ecological information as well as level and flow data to assess the impact of water management activities on the natural environment.

Table 7.01: Information Needs

Needs #	Information Need	Issue #	Action #	Agency	Status	WMP Source
General						
7.1.1	Additional biological and ecological information	5.1.1	2	MNR OPG	Ongoing	2000
7.1.2	Periodic Angler Creel Surveys	5.1.2	1	MNR	Ongoing	
7.1.3	Econmic Contribution of Tourism	5.1.4	1	OPG	Complete	2000
7.1.4	Visitor's Survey	5.1.15	2	MNR OPG	Ongoing	2000
7.1.5	Walleye Spawning and Incubation	5.1.17	1	OPG	Complete	2000
7.1.6	Flow and Water Level Effects on Non-Aquatic Wildlife	5.1.21	1	MNR	Complete	2000
7.1.7	Review Operation of Baptiste Lake	5.1.25/ 5.2.3.5	1/1.2	MNR OPG	Incomplete	2000
7.1.8	Water Level Gauge Between Whitney and Madawaska Village	5.1.29	4	OPG	Complete	2000
7.1.9	Bark Lake Drawdown	5.1.29	6	OPG	Complete	2000
7.1.10	Degree Growing Days During Walleye Incubation Period	5.1.30	1	OPG	Complete	2000
7.1.11	Economic Value of the Recreational Fishery	5.1.15	1	OPG	Complete	2000
7.1.12	Palmer Rapids Dam Minimum flow requirement	5.2.4.6	1	OPG	Incomplete	new
Madawaska River						
7.2.1.1	Algonquin Provincial Park Water Levels	5.2.1.1	1	MNR	Complete	2000
7.2.1.2	Hydrolic Conditions-Rapids Near the Town of Madawska	5.2.1.2	1	OPG	Incomplete	2000
7.2.2.1	Basement Flooding at Madawaska Village	5.2.2.3	2	OPG	Complete	2000
7.2.2.2	Deep Spawning Trout	5.2.2.5	2	MNR	Complete	2000
7.2.2.3	Effects of Winter Drawdown on Furbearers in Bark Lake	5.2.2.6	1	MNR	Complete	2000
7.2.2.4	Impact of Record Low Water Levels on Bark Lake on Wildlife Other Than Fish	5.2.2.7	1	MNR	Complete	2000
7.2.2.5	Bark Lake Dam Valve Gate - Partial Opening	5.1.29	None	OPG	Complete	2000
7.2.3.1	Effects of Water Level Regulation on Productivity of Aquatic Species and Furbearers at Conroy's Marsh	5.2.3.6	1	MNR OPG	Complete	2000
7.2.3.2	Effect of Winter Drawdown on Muskrat in Conroy's Marsh	5.2.3.7	1	MNR	Complete	2000
7.2.3.3	Information Negeek Lake	5.2.3.9	1	MNR OPG	Complete	2000
7.2.3.4	Impact of Flows out of Bark Lake	5.2.3.10	1	OPG	Complete	2000
7.2.3.5	Impact of Flows out of Bark Lake - Verification	5.2.3.10	2	MNR	Complete	2000
7.2.4.1	Exposed Walleye Spawning Beds	5.2.4.1	1	MNR	Complete	2000
7.2.4.2	Drowning of Furbearers	5.2.4.3	1	MNR	Complete	2000
7.2.4.3	Information on Walleye Downstream From Palmer Rapids to Griffith	5.2.4.4	1	MNR	Incomplete	2000
7.2.5.1	Pike Spawning Habitat	5.2.5.4	1, 2	OPG	Incomplete	2000
7.2.5.2	Walleye Spawning Habitat and a Declining Walleye Population	5.2.5.5	1	OPG	Complete	2000
7.2.5.3	Centennial Lake - Fall Walleye Index Netting (FWIN)	5.2.5.5	3	MNR	Complete	2000

Table 7.01: Information Needs Continued

Needs #	Information Need	Issue #	Action #	Agency	Status	WMP Source
Madawaska River Continued						
7.2.5.4	Effects of Wetland and Riparian Ecosystems	5.2.6.1	1	MNR OPG	Complete	2000
7.2.5.5	Effects of Spring Flooding and Daily Summer Water Level Fluctuations on Waterfowl	5.2.5.7	1	OPG	Complete	2000
7.2.6.1	Walleye Spawning at Mountain Chute GS	5.2.6.1	1	MNR	Complete	2000
7.2.7.1	Assessment of the Fishery in Calabogie Lake and Relation of Water Flows to Recruitment of Walleye	5.2.7.2	2	MNR	Complete	2000
7.2.7.2	Walleye Spawning at Barrett Chute GS - Flow Tests	5.2.7.3	1	MNR OPG	Complete	2000
7.2.7.3	Year Class Strength of the Walleye Stock	5.2.7.3	3	MNR	Complete	2000
7.2.7.4	Barrett Chute Spawning Bed	5.2.7.3	4	MNR OPG	Complete	2000
7.2.7.5	Barrett Chute GS Spawning Bed Water Temperature Fluctuations	5.2.7.3	5	MNR OPG	Complete	2000
7.2.7.6	State of Grassy Bay Herpes	5.2.7.7	1	MNR OPG	Incomplete	new
7.2.7.7	Water Fluctuations During the Winter in Grassy Bay	5.2.7.7	2	OPG	Incomplete	new
7.2.7.7	Grassy Bay Wild Rice Production	5.2.7.8		OPG	Incomplete	new
7.2.8.1	Calabogie Gate Operation	5.2.8.2	2	OPG	Incomplete	2000
7.2.8.2	Calabogie GS South Channel Spawning Shoals	5.2.8.5	2	MNR OPG	Complete	2000
7.2.8.3	Assessment of the South Channel Spawning Shoals and Determination of Backwater effect of Stewartville GS	5.2.8.5	3	OPG	Ongoing	2000
7.2.8.4	Minimum Flow Requirements for Walleye Spawning in North Channel of River Calabogie GS	5.2.8.5	4	OPG	Complete	2000
7.2.8.5	Limiting Factors to Production of Walleye, Pike, Muskellunge	5.2.8.7	1	MNR	Complete	2000
7.2.8.6	Cherry Beach Observations	5.2.8.7	2	MNR/OPG	Ongoing	new
7.2.8.7	Cherry Beach Backwater	5.2.8.7	3	OPG	Ongoing	new
7.2.8.8	Cherry Beach - Upstream Shoal	5.2.8.7	4	OPG	Complete	new
7.2.8.9	Stewartville flow to rule curve	5.2.8.1	2	OPG	Incomplete	new
7.2.8.10	Stewartville Bass and baitfish	5.2.8.1	1	OPG	Incomplete	new
7.2.9.1	Spawning in Tributaries	5.2.9.1	1	MNR	Complete	2000
7.2.9.2	Fish Populations in Tributaries of Madawaska Lake	5.2.9.1	4	MNR	Ongoing	2000
7.2.9.3	Walleye Spawning Beds and Effect of Flow Management-Guidelines Reviewed	5.2.9.2	1	OPG	Complete	2000
7.2.9.4	Stewartville Spawning Bed Elevation Profile	5.2.9.3	1	MNR	Complete	2000
7.2.10.1	Effect of Fluctuations in Water Flows on Fish Populations-Shoal Near North Bank	5.2.10.1	2	MNR OPG	Incomplete	2000
Waba Creek						
7.5.1	Waba Creek- Minimum Flow Requirement	5.5.1	1	MNR	Incomplete	2000

Description: An adaptive management approach is being used to deal with the information needs. Additional biological and ecological information as well as data on water level and flow information will be collected to assess and determine the impact of dam and facility operations on the aquatic ecosystem, explore mitigation options, monitor or quantify the state of the environment for an identified issue.

Comments: Numerous studies and analysis have been carried out.

List of Reports to support the information need:

See Appendix C.

7.1.2 Periodic angler creel surveys

Tributary: Madawaska River

Reach: 2-10

Issue #: 5.1.2

Action Item #: 1

Agency: MNR

Status: Ongoing

Purpose: Measure angling pressure, angler catch and harvest, and assess the state of the health of the fishery along with various regulations that may or have been implemented.

Description: This information need is generic to the whole Madawaska River system. Assessing this concern will involve studies that include fisheries assessment through netting projects as well as through angler creel surveys. information needs for specific reaches may vary. Needs directly related to this generic issue and area of concern will be added and prioritized.

Comments: A Creel is planned for Calabogie Lake in the winter of 2010.

7.1.3 Economic Contribution of Tourism

Tributary: Madawaska River

Reach: 2-10

Issue #: 5.1.4

Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Assess the economic activity, including tourism, on the main stem of the Madawaska River.

Description: An assessment of economic activity, including tourism, on the main stem of the Madawaska River was completed in 1999. Baseline information on the commercial activities and other users of the shared resource provides an indicator of the sensitivity of these activities to changes in water levels and flows.

The report discusses the difficulty of assigning a value to the recreational fishery. Reliable estimates of the number and quality of fishing days do not exist and gathering the data was beyond the scope of the baseline study. Further work is required to place a value on the recreational fishery. MNR recommended that placing a value on the recreational fishery is an important information need and should be dealt within a subsequent Information Need.

Comments: Information Need 7.1.11 was created to build on the 1999 report.

List of Reports to support the information need:

Hagler, Bailly (1999).

7.1.4 Visitor's Survey

Tributary: Madawaska River

Reach: 2-10

Issue #: 5.1.15

Action Item #: 2

Agency: MNR and OPG

Status: Ongoing

Purpose: Characterize the activities of visitors on the main stem of the River.

Description: A Visitors Survey was completed in 1997 as part of the public consultation process. Summer seasonal users on the Madawaska River were contacted during July and August of 1997. The survey topics included:

- origin of the users
- age group
- length of stay
- frequency of visit
- type of accommodation
- activities participated in
- amount of money spent per visit

Comments: It is expected that additional surveys will be carried out periodically to monitor the change in activities with time. A copy of this report can be found in Appendix # 6.12 of the WMP (2000).

List of Reports to support the Information Need: Ontario Ministry of Natural Resources and Ontario Power Generation. Madawaska River Water Management Review Final Report (2000).

7.1.5 Walleye Spawning and Incubation

Tributary: Madawaska River

Reach: 2-10

Issue #: 5.1.17

Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Develop flow and level requirements during the walleye spawn and incubation period.

Description: OPG has provided levels and flows to accommodate the walleye since at least 1983. Observations and studies have been used to assess various concerns over the past few decades and have evolved into the current requirements during the walleye spawn and incubation period. OPG and MNR have carried out a number of studies to determine what flow and level requirements are necessary. Two important recent studies are:

- Effects of Hydroelectric Operations on Walleye Spawning, Interim Report 1997 and 1998 (Pope,1999).
- An Assessment of Hydroelectric Operating Effects on Northern Pike, Muskellunge and Walleye Reproduction in the Madawaska River Basin (Rosien, 1999b).

The objectives of the study by Pope, Gregory F. (1999) were:

- Identify and map walleye spawning sites and determine the importance of sites within the influence of a GS or dams
- Relationship between walleye and the natural environment – spring runoff, current velocities, depth, temperature and substrate
- Influence of dam and hydroelectric operations on the spawning environment
- Mitigation and compensation for negative effects of operations.

Direct observations and study data provided an overview of conditions in each reach of the river from 1996, 1997 and 1998. Observations were made at:

- the mouth of the river below the Arnprior Weir
- Stewartville tailwater
- Calabogie - north channel, south channel and at Cheery Beach
- Barrett Chute tailwater
- Mountain Chute tailwater
- Centennial Lake - Camel Chute and Griffith
- Palmer Rapids below Palmer Rapids Dam
- Bells rapids below Bark Lake

The objectives of the study by Rosien, Darwin (1999b) were to determine:

- determine the quality and quantity of pike, walleye and muskellunge spawning habitat
- the relationship between the habitat and hydroelectric operations.

This study was carried out in the spring of 1999. The focus area was Reach 6 Griffith to Mountain Chute and Reach 8 Calabogie to Stewartville. Direct observations were made at various potential spawning areas and observations were related to flows and levels.

Flow and level requirements during the walleye spawn and incubation periods are derived from the above studies and numerous studies prior to the start of formal review process.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999b).

7.1.6 Flow and water level effects on Non-Aquatic Wildlife

Tributary: Madawaska River

Reach: 1-10

Issue #: 5.1.21

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Determine if there is any research documenting the impact of water level fluctuations on non-aquatic wildlife.

Description: A literature review on the subject has determined that some research is available for certain species.

Comments: None

List of Reports to Support the Information Need: None

7.1.7 Review operation of Baptiste Lake

Tributary: Madawaska River /York River

Reach: 3 / York River/
Issue #: 5.1.25 / 5.2.3.5

Action Item #: 1 / 1,2

Agency: MNR and OPG

Status: Incomplete

Purpose: Analyze the use of storage at Baptiste Lake dam and determine the impact on the peak flow of the York River into Kamaniskeg Lake.

Determine if modifications to the operation of Baptiste Lake dam can reduce the peak flow into Kamaniskeg Lake during the spring.

Analyze the flow at Kamaniskeg Lake and determine if the flow spikes during January.

Determine if the perceived spike during January is related to the operation of Baptiste Lake.

Investigate different options for Baptiste Lake to address any negative impact related to potential flow spikes during January.

Description: The preliminary scope of the work may involve two stages. In the first stage the existing data would be analyzed to quantify the relationship between Baptiste Lake and Kamaniskeg Lake. The second stage, if required, would look at potential options.

Comments: None

List of Reports to Support the Information Need: None

7.1.8 Water Level Gauge between Whitney and Madawaska Village

Tributary: Madawaska River

Reach: 1,2

Issue #: 5.1.29

Action Item #: 4

Agency: OPG

Status: Complete

Purpose: Install a temporary gauge between Whitney and Madawaska Village to help estimate the discharge of water from upstream outflows.

Description: OPG installed temporary gauges upstream of Bark Lake in 2000 to monitor the flow and level on the Madawaska and Opeongo River. OPG installed a temporary gauge in Galeairy Lake and downstream of Galeairy Lake, as well as in Opeongo Lake and downstream of Crotch Lake. Water levels fluctuated at both downstream sites and match up fairly well with flow releases. The gauges were installed from mid April to the end of October 2000.

MNR provides regular updates on levels and flows and there are no significant benefits of having additional gauges.

Comments: OPG will make a brief summary of the data at a future SAC meeting.

List of Reports to Support the Information Need: None

7.1.9 Bark Lake Drawdown

Tributary: Madawaska River

Reach: 2,3

Issue #: 5.1.29

Action Item #: 6

Agency: OPG

Status: Completed

Purpose: Review the drawdown of Bark Lake to determine the impact of reducing the drawdown on refilling the lake, and providing flood protection.

Description: Historical records were used to simulate four drawdown target levels. A March 1 drawdown target of 305, 306, 307 and 308 m at Bark Lake were simulated to determine the probability of increasing the refill to 313.50 by May 24 and July 5. Reducing the drawdown target to 308 m from 305 m increased the probability of a refill by May 24 from 57 to 61 percent or a four percent increase. However, the probability of downstream flooding increases much more.

- The probability of exceeding a discharge from Bark Lake of 140 m^3/s increases by 16 percent
- The probability of exceeding an elevation of 283.46 m at Barry's Bay increases by 13 percent
- The probability of exceeding a discharge from Palmer Rapids of 350 m^3/s increases by 13 percent

It is not possible to have a significant increase in the probability of refilling Bark Lake to the summer minimum by May 24 without also increasing the risk of downstream flooding.

Comments: None

List of Reports to Support the Information Need:

Results were presented at the September 26, 2001 SAC Meeting (#6).

7.1.10 Degree Growing Days During Walleye Incubation Period

Tributary: Madawaska River

Reach: 3-10

Issue #: 5.1.30

Action Item #: 1

Agency: OPG

Status: Incomplete

Purpose: Install water temperature probes to assist in the calculation of degree growing days for walleye.

Description: OPG will install water temperature probes to assist in the calculation of degree growing days at a few sites. MNR and OPG will evaluate the data for use in calculating the degree growing days for the walleye at select facilities.

This information will be used to enhance\supplement work by the Walleye Watch members with the intent of reducing the amount of time and number of trips required by volunteers. Temperature probes will be installed on the downstream face of a few dams as it is difficult to place them directly on the shoals and get access to the data.

Comments: None

List of Reports to Support the Information Need: None

7.1.11 Economic Value of the Recreational Fishery

Tributary: Madawaska River

Reach: 2-10

Issue #: 5.1.15

Action Item #: 7.1.3 Recommendation

Agency: MNR

Status: Incomplete

Purpose: Calculate the economic value of the recreational fishery on the Madawaska River.

Description: In 1999, "Economic Profile of the Madawaska River System," was completed by Bailly Hagler. There was limited information available describing recreational uses and values in the system. However, angling was reported to be a major driver of revenues at resorts and campgrounds along the river. It is also a major recreational activity that has a significant non-market value for local residents.

The Madawaska River attracts many recreational anglers to the watershed and the activity is perceived to make a significant financial contribution to the area. An estimate of the recreational fishery contribution could provide useful information to balance the competing uses for Madawaska River water management.

Reliable estimates of the number and quality of fishing days do not exist and gathering the data was beyond the scope of the original study.

Comments: None

List of Reports to support the information need: None

7.1.12 Palmer Rapids Dam Minimum Flow Requirement

Tributary: Madawaska River

Reach : 2 – 4

Issue #: 5.2.4.6

Action Item: 1

Agency: OPG

Status: Incomplete

Purpose: Quantify the impact of increasing the minimum flow from 10 to 14.2 m^3/s at the Palmer Rapids Dam on the flows and levels at Bark Lake and Kamaniskeg Lake.

Description: Increasing the minimum flow requirement at Palmer Rapids will require the use of water in storage at Bark Lake and Kamaniskeg Lake during low flows. Quantifying the required change in the levels and flows to support the minimum flow requirements will used to determine the possible negative impact on recreation uses on Bark Lake and Kamaniskeg Lake.

7.2 MADAWASKA RIVER

7.2.1 Madawaska River Headwaters to Madawaska Village

7.2.1.1 Algonquin Provincial Park water levels

Tributary: Madawaska River

Reach: 1

Issue #: 5.2.1.1

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Review the operation of the dams within Algonquin Park and discuss water level fluctuations with stakeholders.

Description: MNR discussed water management activities with some of the stakeholders. No changes were initiated. However, MNR is now converting a number of the dams to weir structures. This conversion is part of the life cycle planning of the provincial infrastructure. These new structures will not require any log sluices and the discharge from them will change based on the inflow and the weir discharge relationship. Flow will rise and fall based on changing weather conditions.

Comments: None

List of Reports to Support the Information Need: None

7.2.1.2 Hydraulic Conditions - Rapids near the Town of Madawaska

Tributary: Madawaska River

Reach: 1

Issue #: 5.2.1.2

Action Item #: 1

Agency: OPG

Status: Incomplete

Purpose: Determine if water levels in the upper river are controlled by the Bark Lake Dam or by the rapids at the Town of Madawaska.

Description: The first set of rapids on the upper Madawaska River occurs at the Town of Madawaska. The rapids are exposed in the winter when Bark Lake is drawn down, but flooded in the summer when Bark Lake is full. In the winter, these rapids will act as a hydraulic control for upstream water levels. In the summer, it is not yet known if the rapids or the dam are the primary control of water levels in the upper river.

A study will be developed by OPG to determine if water levels in the upper river are controlled by the Bark Lake Dam or by the rapids at the Town of Madawaska.

Comments: None

List of Reports to Support the Information Need: None

7.2.2 Madawaska Village to Bark Lake Dam

7.2.2.1 Basement Flooding at Madawaska Village

Tributary: Madawaska River

Reach: 2

Issue #: 5.2.2.3

Action Item #: 2

Agency: OPG

Status: Complete

Purpose: Assess the basement flooding problem in Madawaska Village and determine if the level of Bark Lake plays a significant role.

Description: Flow and level records at Bark Lake as well as direct site visits and conversations with residents between 1999 and 2008 were used to document and assess the problem. Some buildings lack sump pumps while others

had local drainage problems. Sump pumps were running into ditches that were full, with very little flow through them. Basement flooding was found to be a problem for buildings along the river and at some locations on the Lake.

The experience between 1999 and 2008 has shown that levels more than 60 cm below the absolute maximum failed to prevent basement flooding. Local drainage problems and the lack of sump pumps are believed to play a significant role in the amount of basement flooding that occurs during wet periods of the year. The lack of adequate setbacks and development in the floodplain also were found to be significant factors.

Comments: None

List of Reports to Support the Information Need:

Observations were presented at the November 26, 2003 and July 6, 2005 SAC meetings.

7.2.2.2 Deep spawning Trout

Tributary: Madawaska River

Reach: 2

Issue #: 5.2.2.5

Action Item #: 2

Agency: MNR

Status: Complete

Purpose: Evaluate the possibility of stocking Bark Lake with a species of trout that spawn in deep waters.

Description: The indigenous lake trout stocks in Bark Lake are believed to be extirpated as a result of the 10 m winter drawdown. However, some stocks of lake trout in the province of Ontario are believed to selectively spawn on shoals deeper than 10 m and may be able to survive.

There are numerous restrictive rules regarding the importing of exotic fish species into Canada/Ontario. MNR has a policy that prevents the introduction of new species into Ontario Lakes. There would need to be DFO involvement with any review. However, MNR is modifying the trout species to another commonly used strain and will use fewer larger fish.

A lake trout assessment in 2007 indicates survivability issues particularly with smaller fish being stocked and possibly strained. Strategic stockings in the future will look at using a previous strain of Lake Manitou and stocking at much greater size to reduce predation.

Comments: None

List of Reports to Support the Information Need:

Observations were presented at the October 22, 2008 SAC Meeting (#42).

7.2.2.3 Effects of Winter Drawdown on Furbearers in Bark Lake

Tributary: Madawaska River

Reach: 2

Issue #: 5.2.2.6

Action Item #: 1, 2

Agency: MNR

Status: Complete

Purpose: Document the effects of water management operations on furbearing mammals.

Description: MNR completed a report on the current status of furbearers on the Madawaska River. Nine trappers with registered Crown trap lines were contacted to obtain their opinion on the status of the furbearers. Each trapper was asked about historic numbers of animals trapped versus current numbers as well as their thoughts on the impact of water management activities on their success.

Seven of the nine trappers felt that water management activities have a negative impact on their trapping success and that the population of beavers and muskrats has declined. Five of the trappers observed freezing of animals or crushing of their feed beds due to the winter drawdown on Bark Lake and Centennial Lake. One trapper felt that the lack of the flooding and drying of the Marsh in Conroy's Marsh/Negeek Lake was a factor in the decline of muskrat population.

Comments: A fall inventory of active lodges was not completed.

List of Reports to Support the Information Need:

Lamont, Mark (2001).

7.2.2.4 Impact of Record Low Water Levels on Bark Lake on Fish and Wildlife Populations

Tributary: Madawaska River

Reach: 2

Issue #: 5.2.2.7

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Investigate the impact of low water levels on wildlife.

Description: MNR carried out a literature review as documented in 7.1.6 that focused on wildlife. MNR has been monitoring the fish population using a number of standard monitoring techniques.

FWIN was completed in the fall of 2001, and Summer Profundal Index Netting in 2007. Assessment of the status of fish and wildlife resources is done throughout the district and was completed in 2008 for Bark Lake.

Comments: None

List of Reports to Support the Information Need:

Observations were presented at the October 22, 2008 SAC Meeting (#42).

Fall Walleye Index Netting (FWIN) for Bark Lake 2001.

Summer Profundal Index Netting (SPIN) for Bark Lake 2007.

7.2.2.5 Bark Lake Dam Valve Gate – Partial Opening

Tributary: Madawaska River

Reach: 3

Issue #: 5.1.29

Action Item #: none
Agency: OPG

Status: Complete

Purpose: Determine if it is possible to modify the valves to allow for a partial opening.

Description: The partial opening review was included as part of the information needs description that appeared in the WMP (2000). The open or closed valve limitation at Bark Lake Dam was reviewed by OPG to determine if modifications to vary the opening are possible.

It is not possible to partially open the valves because of potential cavitation problems.

Comments: Rehabilitation work on Bark Lake is currently in the planning stage. The rehabilitation will include the replacement of the existing valves with gates that can be partially opened.

List of Reports to Support the Information Need: None

7.2.3 Bark Lake Dam to Palmer Rapids Dam

7.2.3.1 Effect of Water Level Regulation on Productivity of Aquatic Species and Furbearers at Conroy's Marsh

Tributary: Madawaska River

Reach: 3

Issue #: 5.2.3.6

Action Item #: 1

Agency: MNR and OPG

Status: Complete

Purpose: Assess if the narrow range on Kamaniskeg Lake is adversely effecting the productivity of the marsh.

Description: Three reports have been prepared to help assess the state of the wetlands on the Madawaska River. Observations about waterfowl nesting, plants and mammals and level gauges were installed to collect information about Conroy's Marsh.

Site visits, review of hydrological data and literature were used to determine potential effects of water level and flow rate fluctuations on waterbirds and semi-aquatic mammals dependent on the wetlands (Bland, 2002). Information need 7.2.5.5 describes the impact on waterfowl.

Stable summer water levels in Conroy's Marsh may result in a decline in marsh productivity. However, there is no evidence to support the statement that duck or amphibian populations are not as abundant as they might otherwise be. A summer drawdown would be beneficial for the marsh ecology, birds, fish, furbearers, and other creatures. A summer drawdown would have a significant impact on the recreational uses of Kamaniskeg Lake.

Comments: None

List of Reports to Support the Information Need:

Bland, David (2002).

Bland, David (2003).

Evans, Rob and Roswell, Jim (1998).

7.2.3.2 Effect of Winter Drawdown on Muskrat in Conroy's Marsh

Tributary: Madawaska River

Reach: 3

Issue #: 5.2.3.7

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Review the status of the muskrat population and assess whether the winter operating practice has value for the health of the overall marsh ecology.

Description: It is not possible to measure the effectiveness of this operating practice that has been in place since the 1980s because of the lack of muskrat population data. However, one of the two trappers interviewed by MNR indicated that the muskrats are either frozen out or drowned. Restricting the winter operating range on Conroy's Marsh and Kamaniskeg Lake is believed to have benefit for other species such as preventing the dewatering of spawning grounds. The lack of a summer drawdown may be a limiting factor.

Comments: None

List of Reports to Support the Information Need:

Lamont, Mark (2001).

7.2.3.3 Information on Negeek Lake

Tributary: Madawaska River

Reach: 3

Issue #: 5.2.3.9

Action Item #: 1

Agency: MNR and OPG

Status: Complete

Purpose: Obtain information on the limnology, morphology and fish populations of Negeek Lake.

Description: A lake survey was completed in 1998. The survey included lake contour mapping, water chemistry and some fish sampling. Further information on the fish community and populations was obtained. Lake trout spawning shoals were identified and snorkelled during the fall of 1997. Each shoal with lake trout egg deposition was recorded and identified using a Global Positioning System (GPS). A winter creel was conducted on Kamaniskeg Lake during the winter of 1998 as part of the South Central Ontario Lake Trout Strategy. A regulation change to protect self-sustaining populations of lake trout was implemented for the winter of 1999.

Comments: To further assess the fish population of Negeek Lake a Community Near Shore Index Netting or Fall Walleye Index Netting is recommended to determine abundance and diversity of fish species living in this lake.

List of Reports to Support the Information Need:

Rosien, Darwin (1999a).

Cote, Joff (2001).

Winter Creel Project - Kamaniskeg Lake 1998

Lake Trout Spawning Shoal Assessment - Kamaniskeg Lake 1997.

7.2.3.4 Impact of Flows out of Bark Lake

Tributary: Madawaska River

Reach: 3

Issue #: 5.2.3.10

Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Determine the flow rate required to cover the spawning grounds at Bells Rapids.

Description: Flow tests were conducted in the fall of 1997 to measure spawning bed coverage at various flows. Observations were also made in May 1997. The backwater effect from Kamaniskeg Lake was observed to cover most of the spawning bed at the base of the rapids regardless of the river flow. There was no appreciable difference in coverage within the rapids between the 25 m^3/s and the 50 m^3/s flow scenarios. The 15 m^3/s flow also provided good spawning conditions although some suitable spawning substrates are exposed when flows are reduced from 25 to 15 m^3/s.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.3.5 Impact of Flows out of Bark Lake - Verification

Tributary: Madawaska River

Reach: 3

Issue #: 5.2.3.10

Action Item #: 2

Agency: MNR

Status: Complete

Purpose: Determine the flow rate required to cover the spawning grounds at Bells Rapids.

Description: The river channel at Bells Rapids has gone through some changes and multiple channels now exist. MNR observations in 2007 indicate that a 5 m^3/s flow during the incubation period would be sufficient under low flows and that a 15 m^3/s threshold is sufficient even if more than 25 m^3/s was discharged during the spawn period. MNR has assessed the rapids and have concluded that a 25 m^3/s threshold flow is no longer required if more than 25 m^3/s was discharged during the spawning period.

Comments: None

List of Reports to Support the Information Need: None

7.2.4 Palmer Rapids Dam to Griffith

7.2.4.1 Exposed Walleye spawning beds

Tributary: Madawaska River

Reach: 4

Issue #: 5.2.4.1

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Investigate walleye spawning site below Palmer Rapids Dam.

Description: Spring observations were made of the distribution of spawning material and fish at the spawning sites during the early to late 1990s. Under high flows, the water enters the shallow bank at the end of the rapids along Pine Point. Erosion along the downstream end of Pine Point is believed to have made this area accessible to the walleye. The trees act as eddies for walleye to rest and also spawn. As the high flows recede, these eggs can be left exposed.

Comments: MNR along with the local Fish and Game Clubs will investigate site alterations to reduce erosion during high flows, enhance spawning areas, help to keep fish in the river channel and keep eggs from being exposed.

List of Reports to Support the Information Need: None

7.2.4.2 Drowning of Furbearers

Tributary: Madawaska River

Reach: 4

Issue #: 5.2.4.3

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Determine if high flows during the winter and fall have a negative impact on furbearing mammals in the Palmer Rapids to Griffith Reach.

Description: MNR completed a report on the current status of furbearers on the Madawaska River. Nine trappers with registered Crown traplines were contacted to obtain their opinion on the status of the furbearers. Each trapper was asked about historic numbers of animals trapped versus current numbers, as well as their thoughts on the impact of water management activities on their success.

Two of the nine registered trappers have trap lines within the Palmer Rapids to Griffith Reach. Both trappers no longer trap muskrats in the reach because of the large effort required for a small harvest. One of the trappers indicated that the beavers are drowned out in the winter.

Comments: None

List of Reports to Support the Information Need:

Lamont, Mark. (2001).

7.2.4.3 Information on Walleye Downstream from Palmer Rapids to Griffith

Tributary: Madawaska River

Reach: 4

Issue #: 5.2.4.4

Action Item #: 1

Agency: MNR

Status: Incomplete

Purpose: Assess the fish community, populations and the angling effort for this reach.

Description: Very little information exists about fisheries downstream from Palmer Rapids to the town of Griffith. Due to the riverine nature of this reach, assessment is very difficult using standard fisheries management protocols. Separating this section into two parts, the upper slow water area (Palmer Rapids to downstream of Latchford Bridge) and the lower fast water area (Latchford Bridge to Griffith Bridge), some assessment measures can be implemented. On the upper slow water area from Palmer Rapids to below Latchford Bridge, a bathymetry survey is required. Once the bathymetry is complete, a fisheries inventory project using River Index Netting (RIN) or an electro-fishing boat, could be implemented. On the lower stretch of river from Latchford Bridge to Griffith, a survey using angling or short-set gillnetting would be the only feasible way to inventory this section of river.

Comments: None

List of Reports to Support the Information Need: None

7.2.5 Griffith to Mountain Chute GS

7.2.5.1 Pike Spawning Habitat

Tributary: Madawaska River

Reach: 5

Issue #: 5.2.5.4

Action Item #: 1, 2

Agency: OPG

Status: Complete

P**urpose:** Determine the quality and quantity of pike and muskellunge spawning habitat and the relationship between this habitat and hydroelectric operations.

Description: This study was carried out in the spring of 1999. Direct observations were made at various potential spawning areas and observations were related to flows and levels. Four sites in reach 5 Griffith to Mountain Chute were monitored and assessed.

The winter drawdown dewaters the four potential spawning habitat areas. High flows in three upstream wetlands can re-flood during high flows and then dewater again if the level of Centennial Lake is not refilled high enough. At two sites, the level is required to be in the summer range for complete re-flooding.

It is not possible to refill to the summer level by mid-April because of other needs such as the walleye spawn / incubation and the risk associated with flooding. The operating requirement to continue raising the level of Centennial Lake, once filling has started, should reduce the potential of stranding pike but does not eliminate it.

Comments: Other options may be explored and an action plan developed, as the level and flow determine the extent of flooding and dewatering.

List of Reports to Support the Information Need:

Rosien, Darwin (1999b).

7.2.5.2 Walleye Spawning Habitat and a Declining Walleye Population

Tributary: Madawaska River

Reach: 5

Issue #: 5.2.5.5

Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Determine the quality and quantity of walleye spawning habitat and the relationship between this habitat and hydroelectric operations.

Description: This study was carried out in the spring of 1999. Direct observations were made at various potential spawning areas and observations were related to flows and levels. Ten sites in Reach 5 Griffith to Mountain Chute were monitored and assessed.

The winter drawdown prevents access to some sites until the level is high enough to flood out obstacles or flood suitable substrate. The two most important sites are at the Griffith Bridge and Camel Chute. Walleye can not migrate above Camel Chute and reach Griffith until the water level is above 246.15 m. However, walleye use the spawning area just below Camel Chute. An additional spawning site exists at Highland Falls; this site is believed to block any further upstream migration. Observations were not made at Highland Falls.

The operating requirement to continue raising the level of Centennial Lake once the refill has started will prevent the problem of dewatering the two main spawning sites.

Comments: None

List of Reports to Support the Information Need:

Rosien, Darwin (1999b).

7.2.5.3 Centennial Lake - Fall Walleye Index Netting

Tributary: Madawaska River

Reach: 5

Issue #: 5.2.5.5

Action Item #: 3

Agency: MNR

Status: Complete

Purpose: Compare various fish indices and determine present status of fish community, with a focus on walleye.

Description: The current status of the walleye stock in Centennial and Black Donald Lakes was assessed in 1998 using MNR's FWIN methodology. Results indicate poor walleye populations in Black Donald / Centennial Lake based on provincial standards using the FWIN protocol. The walleye population is in a vulnerable state because of low numbers of fish and unstable age class distribution.

Comments: None

List of Reports to Support the Information Need:

Morgan, George (1999).

Brady, Chuck (2009).

7.2.5.4 Effects on Wetland and Riparian Ecosystems

Tributary: Madawaska River

Reach: 5

Issue #: 5.2.5.6

Action Item #: 1

Agency: MNR and OPG

Status: Complete

Purpose: Assess the potential effects of water level and flow rate fluctuations due to the winter drawdown on the wetlands in Black Donald / Centennial Lake.

Description: Two main studies were conducted to assess the potential impacts associated with the winter drawdown of Mountain GS.

The absence of submergent vegetation, dewatering and periodic re-flooding of some wetlands were documented. The extent and number of times in a spring that the wetlands will be re-flooded depends on the weather and the risk of flooding human habitat. The dewatering and re-flooding of wetlands during the winter/spring is a residual impact of providing some ability to mitigate flooding. There is little that can be done to eliminate the winter drawdown without having a negative impact on the flood risk to humans.

Observations related to waterfowl are covered in Section 7.5.2.5. Observations related to pike and muskellunge reproduction are covered in Section 7.5.2.1.

Comments: None

List of Reports to Support the Information Need:

Rosien, Darwin (1999b).

Bland, David (2002).

Bland, David (2003).

7.2.5.5 Effects of Spring Flooding and Daily Summer Water Level Fluctuations on Waterfowl

Tributary: Madawaska River

Reach: 5

Issue #: 5.2.5.7

Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Investigate the generic effects of water level fluctuations on nesting success.

Assess and monitor wetland areas for breeding waterbirds.

Description: Two studies of the various wetlands along the main stem of the river were conducted. The scope of the two studies was expanded to include the main wetlands assessment from Bark Lake to Arnprior and not just the Black Donald / Centennial Lake area.

The first study looked at the potential effects of water level and flow rate fluctuations on waterbirds and semi-aquatic mammals dependent on the wetlands. The information was derived from site visits, review of hydrological data and a literature review. Site visits were conducted at Conroy's Marsh (reach 3), Mud bay (Reach 3), Griffith Wetlands 1 and 2 (reach 5), Black Donald Lake Wetland (Reach 5), Norcan Lake 1 and 2 (Reach 6), Grassy Bay (Reach 7), as well as Springtown Marsh (Reach 8).

The main findings of the first study were:

- All wetlands supported some breeding waterbirds
- Major limiting factors were shortage of good nesting habitat and emergent vegetation providing foraging, cover and brood-rearing habitat
- Centennial Lake and Stewartville peaking operations causing water level fluctuations that may affect nesting birds
- Winter drawdowns may result in stranding, desiccation, and freezing of fish, amphibians, invertebrates and vegetation
- Water fluctuations discourage diverse riparian aquatic plant communities
- Stable water levels at Conroy's Marsh and Grassy Bay may result in a reduction in marsh productivity in summer months

The second study was carried out from May 2002 to August 2002. Field observations and water level information was collected and used to describe diversity of aquatic bird species in Conroy's Marsh, Grassy Bay, Norcan Lake, Springtown and the Griffith area 1 wetland. Conroy's Marsh and Grassy Bay supported the largest diversity of breeding aquatic birds.

The main findings of the first study were:

Conroy's Marsh

- Largest and greatest variety of aquatic species
- 16 species of aquatic birds observed
- five species know to have nested, 11 have likely nested
- predation is the main factor affecting the reproductive success
- OPG water management in 2002 probably aided by maintaining stable levels
- Significant precipitation event had an adverse effect on reproductive success in April and early May

Grassy Bay

- 13 species of aquatic birds observed
- three nested, six others likely
- mostly unsuitable nesting for ground nesting waterfowl because it is too wet and consisted of dense stands of cattails
- human disturbances most likely factor affecting reproductive success
- not optimum for loons because of limited off-shore nesting and human disturbances

Norcan Lake

- eight species of aquatic birds observed
- four nested, three likely nested
- limited potential because of large expanses of open water and rocky shorelines
- human disturbances, OPG water management and nest predation affecting reproductive success

Springtown Marsh

- nine species of aquatic birds observed
- one nested
- peaking operation discourages breeding of aquatic birds
- shortage of emergent vegetation and interspersion of open water and emergent vegetation as well as water level fluctuations affecting reproductive success

Griffith Area 1

- six species of aquatic birds observed
- one nested; one likely
- winter drawdown and fluctuating water levels have probably resulted in less extensive and diverse vegetation communities

Comments: None

List of Reports to Support the Information Need:

Bland, David (2002).

Bland, David (2003).

7.2.6 Mountain Chute GS to Barrett Chute GS

7.2.6.1 Walleye Spawning at Mountain Chute GS

Tributary: Madawaska River

Reach: 6

Issue #: 5.2.6.1

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Assess the impact of Mountain Chute GS operations on the walleye spawning shoals.

Description: Observations of spawning walleye have been made at the station since 1992, and station flow tests were conducted to study the distribution of flow from the two units since 1996. Because the units are large, operation of a single unit for walleye spawning provides excellent flows and current velocities for spawning throughout the tailwater area, including the artificial spawning shoals constructed by MNR and the fish and game clubs.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.7 Barrett Chute GS to Calabogie GS

7.2.7.1 Assessment of the Fishery in Calabogie Lake and Relation of Water Flows to Recruitment of Walleye

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.2

Action Item #: 2

Agency: MNR

Status: Complete

Purpose: Assess the impact of Barrett Chute GS operations on the walleye population.

Description: Fisheries netting projects were completed by MNR in the fall of 1995 and the spring of 1998 to assess the fish populations of Calabogie Lake. The area of the spawning habitat in the tailwater channel appears to be small and may be limiting the reproduction.

Rehabilitation has enhanced the spawning substrate, which was identified as a limiting factor to walleye reproduction.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.7.2 Walleye Spawning at Barrett Chute GS – Flow Tests

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.3

Action Item #: 1

Agency: MNR and OPG

Status: Complete

Purpose: Conduct flow tests and observations at Barrett Chute GS to determine the minimum flow requirements to promote spawning success.

Description: Flow tests and observations have been made at Barrett Chute GS since 1996. To promote spawning success, during low freshet years, OPG will operate one small Barrett Chute unit (40 m^3/s) from 19:00 to 23:00 EST to provide current for spawning.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.7.3 Year Class Strength of the Walleye Stock

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.3

Action Item #: 3

Agency: MNR

Status: Complete

Purpose: Study year class strength of the walleye stock relative to annual station operation.

Description: Rehabilitation has enhanced the spawning substrate which was identified as a limiting factor to walleye reproduction.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.7.4 Barrett Chute Spawning bed

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.3

Action Item #: 4

Agency: MNR and OPG

Status: Complete

Purpose: Investigate the feasibility of providing additional spawning habitat in the Barrett Chute tailwater.

Description: The feasibility of providing additional spawning habitat in the Barrett Chute tailwater was investigated. The depth of Barrett Chute GS tail water was mapped in September 1998 to identify potential areas. The spawning grounds were built in December 1999.

Comments: None

List of Reports to Support the Information Need:

Speller, Donald (1999).

7.2.7.5 Barrett Chute GS Spawning Bed water temperature fluctuations

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.3

Action Item #: 5

Agency: MNR and OPG

Status: Complete

Purpose: Investigate water temperature fluctuations on the spawning bed associated with the operation of Barrett Chute GS.

Description: Water temperatures were monitored in the tailwater and power canal. Water temperatures were analyzed along with station operation data and flows. Data from 1998 confirmed a water temperature cycling associated with the operation of the station. This phenomenon is the result of the daily warming of surface waters on hot, sunny days in the spring. When the station is not operating, surface water temperatures in the tailwater (and any other standing water) can rise and fall. A four degrees Celsius warning was recorded over the course of a day at Barrett Chute. However, when the station begins operation, water is drawn from the Barrett Chute headpond from a depth interval ranging from the surface to about 16 m. The mixing of the surface and deep water of the headpond lowers the temperature of the tailwater back to the mean daily temperature. This phenomenon was clearly evident in the tailwater in 1998. This effect will not be noticeable when spring flows have high volumes well into May, due to a more constant flow of water going through the station.

Comments: Supplemental data obtained in 2000 confirmed that when flows are higher, the daily water temperature fluctuations did not occur.

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

7.2.7.6 State of Grassy Bay Herpes

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.7

Action Item #: 1

Agency: MNR and OPG

Status: Incomplete

Purpose: OPG and MNR will investigate the state of the amphibian and reptile populations in Grassy Bay.

Description: OPG and MNR will investigate the state of the Herpes populations and review winter water fluctuation data collected as part information need 7.2.7.7.

Comments:

This is a new information need.

List of Reports to Support the Information Need: None

7.2.7.7 Water Fluctuations During the Winter in Grassy Bay

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.7

Action Item #: 2

Agency: OPG

Status: Incomplete

Purpose: Install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the winter.

Description: OPG will install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the winter.

Comments: This is a new information need.

List of Reports to Support the Information Need: None

7.2.7.8 Grassy Bay Wild Rice production

Tributary: Madawaska River

Reach: 7

Issue #: 5.2.7.8

Action Item #: 1

Agency: OPG

Status: Incomplete

Purpose: Install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the summer.

Description: OPG will install temporary water level gauges to quantify the water level fluctuations within Grassy Bay during the summer.

Comments:

This is a new information need.

List of Reports to Support the Information Need: None

7.2.8 Calabogie GS to Stewartville GS

7.2.8.1 Calabogie Gate Position

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.2

Action Item #: 2

Agency: OPG

Status: Incomplete

Purpose: Gate operation will be reviewed to determine if partial operation is possible.

Description: Calabogie GS spill gates operate in an open or closed position. OPG will determine if the gates can be operated at a partial opening.

Comments: None

List of Reports to Support the Information Need: None

7.2.8.2 Calabogie GS South Channel Spawning Shoals

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.5

Action Item #: 2

Agency: MNR and OPG

Status: Complete

Purpose: South Channel spawning shoals are to be assessed for usefulness and spawning success.

Description: This study was carried out in the spring of 1999. Direct observations were made at the spawning areas downstream of the South Channel Spillway and related to flows and levels. The spill through the spillway during the spawning period was limited. Less than 10 fish were observed. Substrate throughout most of the south spillway is ideally suited for walleye. High velocities during significant spring flows and subsequent dewatering potential were not assessed.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999b).

7.2.8.3 Assessment of the South Channel Spawning Shoals and Determination of Backwater Effect of Stewartville GS

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.5

Action Item #: 3

Agency: OPG

Status: Ongoing

Purpose: Determine if the backwater from Stewartville will cover the spawning shoal on the South Channel.

Description: A base flow cannot be provided at the South Channel to protect incubating eggs after the spill, but walleye may be able to spawn successfully just downstream of the spillway, if they spawn below the elevation protected by the backwater effect that originates either from the Stewartville Headpond (144.00 m) or the Cherry Beach Rapids (144+ m). The minimum backwater elevation at the South Channel will be determined from a water level gauge installed upstream of the Cherry Beach Rapids in 1998. Observations will be made during the spring of 1999 to determine if ripe walleye are aggregating downstream of the South Channel. Where hydroelectric effects are deemed to be a primary limiting factor to the fishery, attempts will be made to mitigate or compensate for the effects.

Comments: Studies from 1999 indicate a small number of spawning fish. A much larger number of walleye were observed utilizing the Cherry Beach shoal.

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999).

7.2.8.4 Minimum Flow Requirements for Walleye Spawning in North Channel of River Calabogie GS

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.5

Action Item #: 4

Agency: OPG

Status: Complete

Purpose: Determine the minimum flow requirements for the North Channel.

Description: Flow tests have been conducted and observations of spills and base flows have been made at the North Channel as part of this process from 1996 to 1998. Analysis of results and justification for the minimum flow were completed in 1999. Subsequent observations resulted in the reduction of the minimum flow requirements for the WMP (2009).

Comments: None

List of Reports to Support the Information Need:

MNR and Ontario Hydro (1997).

Pope, Gregory F. (1999).

Rosein, Darwin (1999b).

7.2.8.5 Limiting Factors to Production of Walleye, Pike, Muskellunge

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.7

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Determine the quality and quantity of pike, walleye and muskellunge spawning habitat and the relationship between the habitat and hydroelectric operations.

Description: Potential walleye spawning sites in the South Channel at Calabogie and Cherry Beach were monitored and assessed during the spring of 1999. Very few fish were found in the South Channel despite the potential of the substrate. Observation confirmed that Cherry Beach was a significant spawning area. Up to 40 fish were observed at Cherry Beach compared to less than 10 in the South Channel.

During low flow springs such as 1999 and 2001, the shoal associated with the rock crib at Cherry Beach may become exposed during either spawning and/or incubation. Some observations by Rosien (1999b) and MNR (Boos personal communication) suggest that walleye spawn between the shoal and the north bank where eggs are unlikely to be exposed. However, the SAC requested confirmation that there was no egg exposure problem at this location, and an investigation into the level of protection by the backwater from Stewartville GS if higher elevations are maintained during the spawning/incubation period. Subsequent observation led to a decision to lower the shoal to prevent dewatering of the shoal.

Spawning activity for pike and muskellunge was studied at Springtown Marsh and Balmer Lake during the spring of 1999. Balmer Lake is connected to Springtown Marsh by a small culvert. The bottom elevation of the culvert limits the amount of daily water level fluctuations. Large amounts of aquatic vegetation exists along the northern extent of Balmer Lake. Up to 10 fish were observed in Balmer Lake and none observed in Springtown Marsh. An abundance of submergent vegetation exists in portions of the Marsh. However, emergent species are almost completely absent. Pike and muskellunge spawning habitat is limited in Springtown Marsh.

Comments: none

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999b).

7.2.8.6 Cherry Beach Observations

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.7

Action Item #: 2

Agency: MNR and OPG

Status: Ongoing

Purpose: Monitor the walleye spawning activity and exposed eggs.

Description: Make annual observations of the distribution of spawning walleye at Cherry Beach when flows permit. Make observations of shoal exposure at various flows through direct observation and flow tests. During egg incubation during low spring flows, inspect shoal for exposed eggs.

Comments: None

List of Reports to Support the Information Need:

Observations and discussions occurred at SAC Meetings #8, 9, 10 and 20.

7.2.8.7 Cherry Beach Backwater

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.7

Action Item #: 3

Agency: OPG

Status: Ongoing

Purpose: Determine how far upriver the backwater from the Stewartville Generating Station extends relative to the Cherry Beach Rapids at elevations 144.48 to 144.78 m.

Description: The Cherry beach area was observed at various flow conditions to determine how far upriver the backwater from the Stewartville Generating Station extends relative to the Cherry Beach Rapids.

Periodic observation continue through the walleye watch and OPG staff.

Comments: None

List of Reports to Support the Information Need:

Observations and discussions occurred at SAC Meetings #8, 9,10 and 20.

7.2.8.8 Upstream Shoal

Tributary: Madawaska River

Reach: 8

Issue #: 5.2.8.7

Action Item #: 4

Agency: OPG

Status: Complete

Purpose: Determine if the shoal upstream of Cherry Beach can be lowered to prevent dewatering during the spring.

Description: During low summer flows, the shoal was inspected to determine if the elevation could be lowered to prevent dewatering. Remediation of the shoal upstream of Cherry Beach was completed in the fall of 2003. The shoal was lowered to prevent dewatering of the shoal during the spring.

Comments: Remediation of the shoal just downstream of Cherry Beach is still required.

List of Reports to Support the Information Need:

Observations and discussions occurred at SAC Meetings #8, 9, 10 and 20.

7.2.8.9 Stewartville Flow to Rule Curve

Tributary: Madawaska River

Reach : 8

Issue: #: 5.2.8.1

Action Item: 2

Agency: OPG

Status: Incomplete

Purpose: Develop a "flow to rule curve" for the reach and assess the potential impact of the "curve" on flows and levels in the Stewartville reach as well as the implication on energy production at OPG's five facilities.

Description: Document the details of a "flow to rule curve" from the residents of the reach. Assess the potential impact of the "curve" on flows and levels in the Stewartville reach as well as the implication on energy production at OPG's five facilities.

7.2.8.10 Stewartville Bass and Baitfish

Tributary: Madawaska River

Reach : 8

Issue: #: 5.2.8.8

Action Item: 1

Agency: MNR

Status: Incomplete

Purpose: Determine if 78/30 cm range has an impact on the spawning requirements of the baitfish or Bass.

Description: MNR with the assistance of local residents will investigate if the 78/30 cm range has an impact on the spawning requirements of the baitfish or Bass.

7.2.9 Stewartville GS to Arnprior GS

7.2.9.1 Spawning in Tributaries

Tributary: Madawaska River

Reach: 9

Issue #: 5.2.9.1

Action Item #: 1

Agency: MNR

Status: Complete

Purpose: Conduct studies using local fish and game club members, property owners to determine extent of use of tributaries for spawning.

Description: Observations made by the local Walleye Watch have confirmed that walleye spawn at the mouth of Waba Creek.

Comments: None

List of Reports to Support the Information Need: None

7.2.9.2 Fish Populations in Madawaska Lake

Tributary: Madawaska River

Reach: 9

Issue #: 5.2.9.1

Action Item #: 4

Agency: MNR

Status: Ongoing

Purpose: Conduct periodic assessments to establish age class data on walleye for assessing recruitment and the success of annual reproduction.

Description: An assessment of fish species composition and stocks will be conducted in Lake Madawaska to update the last detailed survey (Arnprior Reservoir Fish Studies – 1997) conducted by OPG in 1977, a year after reservoir creation. Reproduction for walleye will be related to hydrological and hydraulic conditions during the spring spawning and incubation.

The two published reports deal with the reproduction for walleye and related hydrological and hydraulic conditions during the spring spawning and incubation. The walleye spawning grounds in the tailwater of Stewartville are believed to be the most important spawning habitat.

Comments: None

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999b).

7.2.9.3 Walleye Spawning Beds and Effect of Flow Management - Guidelines Reviewed

Tributary: Madawaska River

Reach: 9

Issue #: 5.2.9.2
Action Item #: 1

Agency: OPG

Status: Complete

Purpose: Review the guidelines from the WMP (2000).

Description: OPG and MNR have reviewed the guidelines from the WMP (2000) and have made minor modifications. The flow threshold has been adjusted to cover the usual range of flow through the units and an additional hour of water has been added.

Comments: Ongoing monitoring of spawning conditions at this location are captured by information needs 7.1.5.

List of Reports to Support the Information Need:

Pope, Gregory F. (1999).

Rosien, Darwin (1999b).

7.2.9.4 Stewartville Spawning Bed Elevation Profile

Tributary: Madawaska River

Reach: 9

Issue #: 5.2.9.3

Action Item #:1

Agency: MNR

Status: Complete

Purpose: Determine if the operation of the spill gates erodes or destroys the walleye spawning bed.

Description: A full spill test was completed at Stewartville. MNR and OPG monitored the spawning ground during the test and observed some rock movement. However, the shoal remained intact. If a flood release is required, rehabilitation work may be necessary.

Comments: Observations were made. However, a formal report was not produced.

List of Reports to Support the Information Need: None

7.2.10 Arnprior GS to Ottawa River

7.2.10.1 Effect of Fluctuations in Water Flows on Fish Populations - Shoal Near North Bank

Tributary: Madawaska River

Reach: 10

Issue #: 5.2.10.1

Action Item #: 2

Agency: MNR and OPG

Status: Incomplete

Purpose: Determine the importance of the rip rap section of the north bank and the exposed rock just downstream of the weir and monitor the area to determine if eggs are dewatered.

Description: OPG and MNR will monitor the area to determine if eggs are dewatered and determine if the area is a significant spawning area. The main spawning grounds are located around the Island.

Comments: New to WMP 2009

List of Reports to Support the Information Need: None

7.3 OPEONGO RIVER

Nothing noted.

7.4 YORK RIVER

Nothing noted.

7.5 WABA CREEK

7.5.1 Waba Creek - Minimum Flow Requirement

Tributary: Waba Creek

Reach:

Issue #: 5.5.1

Action Item #:1

Agency: MNR

Status: Incomplete

Purpose: Confirm that a minimum flow of 0.14 m^3/s is passed through the White Lake dam.

Description: Preliminary work indicates that a notch between the 2nd and 3rd log of the middle log sluice will pass the minimum flow requirement. Field measurements will be used to confirm that the notch is adequately sized to pass the required flow of 0.14 m^3/s.

Comments: New to WMP 2009

List of Reports to Support the Information Need: None

7.6 OTHER TRIBUTARIES

Nothing noted.

8 OPTION DEVELOPMENT AND RESOLUTIONS

This WMP builds on the published WMP from 2000. Prior to the WMP (2000), each dam or facility was operated without a formal WMP. The operating constraints developed for the WMP (2000) were based on decades of informal consultation with the public and various government agencies including MNR.

Operating constraints from the original WMP (2000) required changes to reflect the new regulatory requirements. Operating constraints at each dam or facility were evaluated on a case-by-case basis. Constraints develop for the WMP (2000) were originally classified as:

- OPG constraints – developed due to the electrical, structural or legal requirements of the dam or facility. Each location has a normal operating range. Some have additional storage available for flood protection or energy reserve during critical periods.
- Citizenship constraints – voluntary constraints developed to benefit other users of the water are subject to watershed conditions. Examples are summer levels to enhance recreational activities. A reasonable effort is made to fulfill the constraint.
- Environmental constraints – constraints developed to protect or enhance the natural environment.

Limits like maximum, minimum reservoir levels and fisheries requirements were considered limits that must not be violated. While citizenship constraints such as summer reservoir levels were voluntary and adhered to on a reasonable effort basis, they could be exceeded during electrical system energy emergency. Citizenship limits from the WMP (2000) can no longer be based on a reasonable effort because of the lack of enforcement based on what justifies a reasonable effort.

Operating constraints from the WMP (2000) were carried over into the WMP (2009) because they meet at least one of the following constraint principles:

- legal requirement
- facility limitation
- demonstrated benefit
- reasonable scientific basis to conclude that there would be a benefit

Some constraints from the WMP (2000) were modified or eliminated because they meet one of the following limitations:

- the benefit is at the expense of another use
- level and flow are not perceived to be the most significant factor
- actions or changes by other agencies/individuals or corporations would achieve a similar benefit

Most constraints from the WMP (2000) were carried through to the current WMP. However, a few constraints were adjusted or eliminated because of the failure to meet at least one of the constraint principles or because they meet one of the limitations. Section 9.1.1 describes the compliance framework. The compliance framework is based on mandatory and conditional constraints. Mandatory constraints apply at all times. Conditional constraints maintain the flexibility of the WMP (2000) while documenting the reasonable effort in an enforceable format.

Consequently, the preparation of this WMP (2009) did not involve weighing of alternatives, weighing of options or any cost-benefit analysis for the operations of the Madawaska River; however, consideration for options was given to the Waba Creek tributary. This tributary, new to the 2009 WMP, has three small privately-owned generating stations.

Since 2000, a number of options have been put forward, trials have been conducted and resolutions have been adopted. Changes in operation from the 2000 plan to the 2009 WMP, are documented in this section.

This section is divided into subsections based on the main tributaries.

8.1 GENERAL

None

8.2 MADAWASKA RIVER

8.2.1 Madawaska River Headwaters to Madawaska Village

None

8.2.2 Madawaska Village to Bark Lake Dam

8.2.2.1 Bark Lake - Absolute Maximum

Issue: 5.2.2.3

Information Need: 7.2.2.1

Compliance Table: 9.07

The maximum elevation of Bark Lake in the WMP (2000) was reduced by 4 cm to try to prevent or reduce basement flooding in the Madawaska Village. This measure was ineffective at solving the problem. The limit in the WMP (2009) was adjusted back to 313.94 m because actions or changes by other agencies or individuals would achieve a similar benefit.

OPG will provide a buffer below the 313.94 m based on risk factors. This buffer will change with conditions and OPG will rarely operate above 313.90 m.

8.2.2.1.1 Bark Lake - Summer Maximum

Issue: 5.2.2.4

Information Need: None

Compliance Table: None

The summer maximum was 313.80 m in the WMP (2000). The summer maximum was originally established to provide a buffer for sudden increases in flow and to accommodate some docks that were not built to tolerate the maximum operating level. OPG will provide a buffer below the 313.94 m based on risk factors. This buffer will change with conditions such as high or low flow periods. Operations above 313.80 m may flood out some crib docks. However, individuals are encouraged to use floating docks or make adjustments to existing docks to tolerate the full operating range. Adjustments of docks or use of floating docks is a reasonable action that will eliminate any problems. Action by others is expected to have a better outcome than establishing a summer maximum because the level does occasionally rise above 313.80 m for many days.

8.2.2.2 Bark Lake – Spring Redraw

Issue: None

Information Need: None

Compliance Table: 9.07

The Bark Lake redraw constraint was set to 20 cm because of the significant uncertainty around future inflows and impact of flow changes from dams upstream. The 20 cm threshold was introduced to cover off what was deemed a reasonable over-estimation of inflows.

MNR operates numerous dams upstream of Bark Lake. MNR must first send staff to get water level readings at numerous sites and make adjustments in the field. Communication of flow changes at MNR dams often occurs long after OPG have already made adjustments at Bark Lake and Palmer Rapids and sometimes changes made on Fridays or not communicated until Monday. The 20 cm redraw was established as a reasonable threshold at which problems associated with redrawing the level may start to have consequences.

8.2.2.3 Bark Lake - Winter Maximum

Issue: 5.2.2.8

Information Need: None

Compliance Table: None

The winter drawdown was put in place as a test after the WMP (2000) was published. The change was not carried though to the WMP (2009) because the use of floating docks would alleviate the problem associated with docks, and because there is no scientific basis to conclude that an earlier drawdown would prevent or reduce shoreline erosion.

8.2.3 Bark Lake Dam to Palmer Rapids Dam

8.2.3.1 Bark Lake - White-water Minimum Flow

Issue: 5.2.2.2

Information Need: None

Compliance Table: 9.08

White-water releases are not considered regulatory requirements. The white-water releases are documented in Chapter 9 as a note. It is difficult to determine the cost to OPG and benefit associated with white-water releases to other corporations and individuals. Rather than get tied into the cost and benefit analysis, the releases will continue as set out in the operating notes but will not be enforceable limits. The Amendment process is available to change this note to a regulatory requirement if required.

8.2.3.2 Kamaniskeg Lake – Summer Maximum/Summer Minimum

Issue: 5.2.3.3

Information Need: None

Compliance Table: 9.09

The summer operating range at Kamaniskeg Lake is 283.00 +/- .09 m. The 18 cm range was adjusted higher and lower. However, when higher than 283.09 or lower than 283.91, individuals from either Kamaniskeg Lake or Negeek Lake indicated a significant negative impact. The use of 283.00 m as the middle point of summer range provides a better balance between Kamaniskeg Lake and Negeek Lake.

8.2.4 Palmer Rapids Dam to Griffith

None

8.2.5 Griffith to Mountain Chute GS

8.2.5.1 Mountain Chute - Summer Minimum

Issue: 5.2.5.1

Information Need: None

Compliance Table: 9.11

The summer operating range, defined as the period from the May long weekend to Thanksgiving at Mountain Chute was adjusted for the WMP (2000). The summer range was readjusted on a test basis in 2005. The summer operating range is limited to 40 cm when flows are lower and allows for a 60 cm range when flows are higher. The flow-based summer range provides benefit to recreational use under lower flows and provides greater flexibility for power operations under high flow conditions.

8.2.5.2 Mountain Chute - Winter Maximum

Issue: 5.2.5.2

Information Need: None

Compliance Table: None

The requirement for a winter drawdown was removed from the WMP because there is already a 60 cm buffer around the lake. There is no reasonable scientific basis to conclude that there would be reduced erosion. Individuals can reduce damages to docks and other structures by removing floating dock systems and other structures prior to the freeze-up.

8.2.5.3 Mountain Chute - Spring Redraw

Issue: 5.2.5.4, 5.2.5.6

Information Need: 7.2.5.1, 7.2.5.4

Compliance Table: 9.11

The redraw constraint was set to 20 cm because of the significant uncertainty around future inflows. The 20 cm threshold was introduced to cover off what was deemed a reasonable over-estimation of inflows. The 20 cm redraw

represents a reasonable threshold at which problems associated with redrawing the level may start to have consequences.

8.2.6 Mountain Chute GS to Barrett Chute GS

8.2.6.1 Barrett Chute – Walleye Spawn and Incubation Level

Issue: 5.2.6.1

Information Need: 7.2.6.1

Compliance Table: 9.13

The limit in the WMP (2000) stated both 200.70 and 200.90 m as the spawn limit. A level of 200.70 m was consistent with the use of the summer range at other sites. Observations of the spawning grounds at 200.70 m also confirmed that the spawning grounds were not de-watered at a level of 200.70 m.

8.2.7 Barrett Chute GS to Calabogie GS

8.2.7.1 Barrett Chute – Minimum Walleye Spawn Flow

Issue: 5.2.7.3

Information Need: 7.2.7.2

Compliance Table: 9.14

Walleye spawning / incubation flows documented in the WMP (2000) were based on typical flow values. Turbine flows change based on the difference between the headwater and tailwater or net head. All walleye incubation and spawn flows were adjusted to reflect the minimum net head conditions that are expected to occur during the spawn or incubation period. This assessment resulted in a lowering of the minimum flow conditions at Barrett Chute.

8.2.7.2 Calabogie – Absolute Maximum Level

Issue: 5.2.7.1

Information Need: None

Compliance Table: 9.15

The Calabogie maximum was reduced by 7 cm in the WMP (2000). The maximum was reduced to provide a buffer for high water levels and erosion. There is no reasonable scientific basis to conclude that there would be reduced erosion, and OPG will provide a buffer below 154.17 m based on risk factors. This buffer will change with conditions. However, OPG will rarely operate above 154.10 m.

8.2.8 Calabogie GS to Stewartville GS

8.2.8.1 Calabogie – Minimum Walleye Spawn/Incubation Flow

Issue: 5.2.8.5

Information Need: 7.2.8.2, 7.2.8.4

Compliance Table: 9.16

The requirements for the North Channel have been reduced because the area is not as significant an area as Cherry Beach. The South Channel has as much potential as the North Channel for spawning as well as greater flow to attract fish.

8.2.9 Stewartville GS to Arnprior GS

8.2.9.1 Stewartville – Minimum Walleye Spawn Flow

Issue: 5.2.9.2

Information Need: 7.2.9.3

Compliance Table: 9.18

Walleye spawning / incubation flows documented in the WMP (2000) were based on typical flow values. Turbine flows change based on the difference between the

headwater and tailwater or net head. All walleye incubation and spawn flows were adjusted to reflect the minimum net head conditions that are expected to occur during the spawn or incubation period. This assessment resulted in a lowering of the minimum flow conditions at Stewartville.

8.2.10 Arnprior GS to Ottawa River

8.2.10.1 Arnprior - Minimum Dilution Flow

Issue: 5.2.10.2

Information Need: None

Compliance Table: 9.20

The minimum flow requirement in the WMP (2000) was based on typical flow conditions. The minimum flow requirement was adjusted to reflect the worst case net head conditions that are expected to occur at Arnprior.

8.2.10.2 Arnprior - Maximum Summer Flow

Issue: 5.2.10.3

Information Need: None

Compliance Table: 9.20

The requirement for running one unit for 24 hours before a second unit can generate during the summertime was reduced to 18 hours. This change occurred because there is a high probability that OPG may need to spill water instead of generate power when flows are quite high and energy demand is low during the spring. This requirement would benefit recreational uses at the expense of power production.

8.3 OPEONGO RIVER

None

8.4 YORK RIVER

None

8.5 WABA CREEK

8.5.1 Waba Creek Minimum Flow Requirement

Issue: 5.5.1

Information Need: 7.5.1.1

Compliance Table: Section 9.5.1, 9.26, 9.28., 9.30

A mandatory change to the 1997 Operation plan was the establishment of a continuous minimum flow requirement through the White Lake Dam. Through field investigations conducted by MNR, a minimum flow of 0.14 cms has been determined to be sufficient for the maintenance of fish habitat and other ecological concerns in Waba Creek during low water conditions. Consequently, with the establishment of this flow, the level of White Lake may drop below the water level target and buffer in order to maintain the minimum flow requirements during extreme low water conditions.

The compliance framework for the three generating facilities on Waba Creek consists of a flow limit. The flow limit has been established as a result of the minimum flow requirement of 0.14 m^3/s for the White Lake Dam and varies for each unit. Minimum flow through the Fraser GS is achieved through leakage through the dam. A notch in the Stewart dam provides 0.07 m^3/s through the diversion channel and 0.07 m^3/s in the original creek bed. Similarly, a notch in the Barrie dam provides 0.093 m^3/s to the original creek bed and 0.047 m^3/s to the diversion channel.

8.5.2 Monitoring Levels To The 1/10 Of A Foot

Issue: 5.5.2

Information Need: None

Compliance Table: Section 9.5.1

The White Lake Dam Operation Plan (1997) used a three-inch above and below margin to allow for evaporation, heavy rainfall and other factors. The gauge at the dam indicates measurements in feet; however, the increments on the gauge are in tenths of a foot and the dam has been operated in tenths of a foot since the Operation Plan was put in place. To facilitate both MNR and the public when reading the gauge at the dam, a mandatory administrative change to the Operation Plan was made that all references will be in tenths of a foot with respect to this margin. The three-inch margin is now referred to as 0.3 ft margin.

8.5.3 Winter Operating Range

Issue: 5.5.3

Information Need: None

Compliance Table: Section 9.5.1

A change to the 1997 Operation Plan was that a 0.3 ft below margin was added to the over-winter level. All target levels for the entire year are now subject to a 0.3 ft above and below fluctuation margin as natural variations in water levels can occur year-round. The target level and therefore winter holding level will still remain 3.5 ft.

This was presented to the public as a proposed change to the Operation Plan, which was subsequently approved.

8.5.4 Spring Target Elevation

Issue: 5.5.5

Information Need: None

Compliance Table: Section 9.5.1

Two proposed, and subsequently approved, changes to the 1997 Operation Plan related to the spring target level. The target level was increased from 5.0 ft to 5.2 ft for the May 1 to May 15 period. However, depending on the timing of the spring freshet, attempts will be made to attain this level earlier to facilitate pike spawning. This will not change the target level; however, if 5.2 ft can be attained by April 15 without ice impacting shorelines, then this attempt will be made to do so. This earlier fill will be subject to spring conditions each year.

9 OPERATING PLAN AND COMPLIANCE FRAMEWORK

This section is divided into seven subsections. The level and flow limits at each facility are outlined in this section. Details of the Amendment process, Enforcement and Compliance are provided in Subsection 9.1 and 9.2. Subsection 9.3 to 9.7 outline facility-specific level and flow requirements.

9.1 PLAN ENFORCEMENT AND COMPLIANCE

Dam owners must ensure that facilities are operated in accordance with the operating requirements of this WMP. This legal requirement is set out in Section 23.1(7) of the LRIA.

Section 23.1 (7) of LRIA was amended in June 2002, establishing a legal requirement that dam owners must ensure that their facilities are operated in accordance with the operating requirement of a water management plan. As a result, the operating constraints, as presented in the WMP 2000, have been examined and form the basis for this WMP. The flow and level requirements in this WMP are mandatory as specified in subsections 9.3 to 9.7. Enforcement action may be taken where these requirements are not met.

Dam owners are also responsible for on-going self-monitoring. All operations outside the approved operating regime for a facility are considered to be incidents and all incidents must be reported to MNR.

The mandatory self-monitoring requirements of this plan include:

a) The dam owner will report any deviations from the operating requirements of the water management plan (i.e. any operations outside the operating regimes described in Section 9) to MNR (verbal report within one business day, and written report within ten working days) providing details on the following:

- the nature of the incident
- why it happened
- what is being done to bring the operation back into the approved operations
- how long it will be before the operation is back into approved operations

b) The dam owner will maintain and retain records of all level and flow information from each of their facilities, and will create and maintain a permanent archive of those records for future reference.

- OPG Facility Recording Requirements:
  - Detailed records at the resolution specified in table 9.02 and 9.03 for a period of the current year plus five years
  - Daily average records into perpetuity
- Waba Creek Facility Recording Requirements:
  - June to September: Recording of water levels at staff gauge three times per week (gauge set at zero (top of the dam) water level readings would be above and below the zero).
  - October to May: Visual inspection of dam two times per month to ensure the dam is free of debris.
- BLP Recording Requirements
  - Recording Requirements for BLP are set out in the BLP Simplified WMP

c) The dam owner will provide level and flow records to MNR at any time upon request.

d) The owner will submit an annual report summarizing the operational compliance history for each facility within 30 days of the end of each calendar year.

e) All written flow and level compliance reports will be signed and dated by the dam owner or a designate.

f) MNR will also, from time to time, monitor compliance through periodic site inspections (as set out in Section 20 of the LRIA), audits and investigations of public complaints. Nothing in this WMP precludes the Minister from making further orders under the LRIA.

As previously stated, MNR will review all incidents where the operations deviate from the flow and level requirements in this WMP. These reviews may include a range of actions from reviewing the report and discussing the issue with the owner/operator up to and including an onsite investigation. The review will take into account a number of factors including weather, the intent and extent of the incident, failure of equipment and unforeseen events. In situations where an incident has been determined to be non-preventable, the investigation will not proceed further. If an incident is determined to have been preventable, it will be considered a non-compliance event. Before enforcement action is taken, MNR will complete their investigation considering the nature, severity, and impacts

of the incident, and the underlying causes.

Section 23.1 (7) of LRIA was amended in June 2002, establishing a legal requirement that dam owners must ensure that their facilities are operated in accordance with the operating requirement of a water management plan. As a result, the operating constraints, as presented in the 2000 Report, form the basis for this operating plan.

The operational plan applies to over 30 facilities that are operated by a number of agencies including MNR, private companies and publicly-held corporations. Given the complexity of this system of water control structures on the Madawaska River watershed, a single consistent framework for all facilities is not possible. Therefore this plan implements a number of regulatory frameworks to address the unique nature of each facility as well as the environmental and economic factors influencing operations. The compliance framework that exists for the numerous facilities within the Madawaska watershed is described in Sections 9.2.1 to 9.2.4.

MNR is both a regulator and operator within the watershed. MNR facilities are not governed by Section 23.1 of the LRIA because these facilities are not operated to augment or benefit waterpower generation.

MNR will endeavour to follow the rule curves established in this WMP. The rule curve specifies the expected level or typical operating band at a given point in time. Variation or deviation can occur under extreme or special circumstances.

9.1.1 OPG Facility Compliance Framework

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Conditional limits apply once the prescribed conditions are met. Two examples of the conditional limits are provided below.

Example 1: The minimum walleye spawn flow at Bark Lake is required once three conditions are fulfilled. The three conditions are as follows: the water temperature has reached 6 ^{0}C, MNR has confirmed walleye activity, and MNR has provided 24 hours notice of the start of the spawning period.

Example 2: An IESO energy emergency is declared during the spawn period. OPG may not be able to draw to the energy emergency minimum at Stewartville because of condition number four, which specifies that the walleye spawn or incubation flow requirements are not active.

There are 11 types of level limits within the compliance framework on the OPG portion of the Madawaska River. Descriptions of the 11 limits are outlined below.

1. Absolute Minimum: The mandatory minimum level that the facility can be reduced to for operational purposes. More restrictive operations apply under specified conditions. The level may be reduced below the specified value for specific maintenance activities or during facility contingencies.
2. Absolute Maximum: The mandatory maximum level that the facility can be raised to for operational purposes. More restrictive operations apply under specified conditions. The level may be increased above the specified value under specified conditions or facility contingencies.
3. Summer Minimum: A conditional limit to provide a reasonable water level for the benefit of recreational users of the water impounded by the facility. The level may be reduced below the specified summer minimum when certain conditions of another limit type are fulfilled.
4. Summer Maximum: A conditional limit to provide a reasonable water level for the benefit of recreational users of the water impounded by the facility. The level may be increased above the specified summer maximum when certain conditions of another limit type are fulfilled.
5. Normal Minimum: A conditional limit to provide emergency energy to the Ontario Electrical System during an energy emergency. This limit restricts the use of the water in storage from the specified value down to the absolute minimum for use in an energy emergency.
6. Spring Redraw: A conditional limit to reduce potential stress on the aquatic ecosystem during a critical period of reproduction. This limit prevents the removal of water from seasonal storage (reduction in the water level) for energy production. A redraw may occur under certain specified conditions.
7. Muskrat Range: A conditional range to restrict the winter drawdown and reduce the potential of an ice cap blocking the entrances to the muskrat lodges.

8. Flood Maximum: A conditional limit to provide water storage capabilities to reduce peak flows during periods of significant downstream flooding.
9. Walleye Minimum: A conditional limit to prevent the dewatering of walleye spawning areas.
10. Walleye Maximum: A conditional limit to reduce the potential for dewatering of walleye eggs as flows naturally drop off.
11. Pike Minimum: A conditional limit to prevent the dewatering and stranding of pike in suitable spawning habitat.

There are five types of flow limits within the compliance framework on the OPG portion of the Madawaska River. Descriptions of the five limits are outlined below.

1. Minimum Aquatic Ecosystem Flow: A mandatory limit to provide a minimum flow to ensure a reasonable amount of protection for the aquatic ecosystem. The minimum flow may apply to the entire facility or a specified portion of a facility. The flow may be reduced below the specified value with MNR and DFO consent for specific maintenance activities or during facility contingencies.
2. Minimum Walleye Spawn Flow: A conditional limit to provide a reasonable flow to attract walleye to specific spawning locations at a facility. The minimum flow may apply to the entire facility or a specified portion of a facility.
3. Minimum Walleye Incubation Flow: A conditional limit to provide a reasonable flow during the walleye incubation period at specific spawning locations at a facility. The minimum flow may apply to the entire facility or a specified portion of a facility.
4. Maximum Summer Flow: A conditional limit to reduce water velocities in the river to benefit recreational users downstream of the facility.
5. Minimum Dilution Flow: A conditional limit to provide an adequate quantity of water over a specified period to flush out sewage treatment effluent.

In addition to the mandatory and conditional limits, there are a few notes of interest. Notes of interest are not items for compliance.

1. White-water Minimum Flow: A note of interest to provide releases of water that benefit white-water communities. These notes of interest are neither a mandatory or conditional requirement. The implementation of the flow releases follows the documented guidelines contained with the note.
2. Flood Threshold: A note of interest to document a threshold that is known to cause concern for some individuals.

9.1.1.1 OPG Level Compliance - General Principles

The general principles applicable to the OPG water level portion of the compliance framework of the WMP are outlined below.

1. Level compliance is based on the calm or static level measured at specified gauge locations. The calm level represents the level that would be experienced without any wind and or wave action.
2. Compliance will be based on the level measured at the locations specified in Table 9.01. OPG has six types of devices deployed to measure water levels on the Madawaska River. The devices are Staff Gauges, Electric Tape Gauges (ETG), Chain / Wire Gauge (Chain), Float and Tape, Dry Gas Purge System (Bubbler) and Pressure Transducers (PT). Descriptions of the primary devices deployed by OPG on the Madawaska River are included in the Glossary (section 11).
3. The minimum required measurement interval of each gauge is specified in Table 9.02.
4. Water level records reported to the nearest centimetre will be used for compliance.
5. A published level which is within 1 cm of a mandatory or conditional limit will not be considered an incident.
6. OPG must maintain at least one primary measuring device at each gauge location with the measurement frequency as specified in Table 9.02. However, OPG is permitted to suspend gauge or device measurements at a particular gauge location during regular maintenance activities.
7. OPG will obtain manual readings of all primary measuring devices at the specified gauge locations for compliance once per month and with no period of more than six weeks between readings. However, OPG may indicate that a gauge is unavailable when an ice cap on the water surface prevents the normal reading of a primary device.

Table 9.01: Level Compliance Gauges

Gauge Name	Primary Device(s)	Well	Location
02KD007 - Bark Lake Dam HW	Tape Gauge, Bubbler	No	Upstream face of the main dam
02KD007B - Bark Lake Dam TW	Staff	No	130 m downstream of the dam
02KD052 - Barry's Bay	Staff, ETG, Bubbler	Yes	Barry's Bay dock off Siberia Road
02KD055A - Kamaniskeg Lake (Upper)	Staff	No	120 m upstream of the north channel dam
02KD004 - Madawaska River at Palmer Rapids		Yes	HWY 515 Bridge over the Madawaska River. Approximately 3 km downstream from the dam operated by Water Survey of Canada
02KD056 - Mountain Chute HW	Chain, Float, ETG	Yes	Upstream face of the main dam
02KD056B - Mountain Chute TW	Chain, Float, ETG	Yes	Downstream face of the main dam
02KE051 - Barrett Chute HW	Chain, Float, ETG, PT	Yes	30 m upstream from the face of the main dam
02KE053 - Barrett Chute Intake	Chain, Float, ETG, PT	Yes	15 m upstream from the face of the power house
02KE051B - Barrett Chute TW	Chain, Float, ETG, PT	Yes	Downstream face of the main dam
02KE052 - Calabogie Lake North Channel	Staff, Float, ETG	Yes	Upstream face of the north channel Dam
02KE003 - Calabogie HW	Staff, Float	Yes	Upstream face of the power house
02KE003B - Calabogie TW	Staff, Float	Yes	Downstream face of the power house
02KE005 - Stewartville HW	Chain, Float, ETG	Yes	Upstream face of the main dam
02KE005B - Stewartville TW	Chain, Float, ETG	Yes	Downstream face of the main dam
02KE054 - Arnprior HW	Chain, Float, ETG	Yes	Upstream face of the main dam
02KE054B - Arnprior TW	Chain, Float, ETG	Yes	Downstream face of the main dam

Table 9.02: Compliance Measurement Interval

Gauge Location	Measurement Interval
02KD007 - Bark Lake Dam HW	Once every 60 minutes
02KD007B - Bark Lake Dam TW	Once following each flow adjustment, but not less frequent than once every seven days
02KD052 - Barry's Bay	Once every 60 minutes
02KD055A - Kamaniskeg Lake (Upper)	Once following each flow adjustment, but not less frequent than once every seven days
02KD004 - Madawaska River at Palmer Rapids	As operated by Water Survey of Canada
02KD056 - Mountain Chute HW	Once every five minutes
02KD056B - Mountain Chute TW	Once every five minutes
02KE051 - Barrett Chute HW	Once every five minutes
02KE053 - Barrett Chute Intake	Once every five minutes
02KE051B - Barrett Chute TW	Once every five minutes
02KE052 - Calabogie Lake North Channel	Once every five minutes
02KE003 - Calabogie HW	Currently not available
02KE003B - Calabogie TW	Currently not available
02KE005 - Stewartville HW	Once every five minutes
02KE005B - Stewartville TW	Once every five minutes
02KE054 - Arnprior HW	Once every five minutes
02KE054B - Arnprior TW	Once every five minutes

8. An incident will occur when the level is outside of the mandatory or conditional requirements for a period of 30 minutes or more at one of the five OPG Generating Stations.
9. An incident will occur when the daily average value level is outside of the mandatory or conditional requirements at either Bark Lake or Kamaniskeg Lake.
10. As noted above, OPG will report to MNR within one business day of discovering an incident.
11. In the event of a discrepancy between primary devices, the definition of an "discovering an incident" will allow for the completion of an investigation of the primary gauge devices to confirm that a non-compliance event has occurred and is not due to device failure or error.

    An investigation of the primary measuring devices is permitted provided:

    - there is at least a 1 cm discrepancy between water levels obtained from the primary measuring devices
    - and at least one primary measuring device indicates a level that is not within the mandatory or applicable conditional level

    OPG has up to 31 days from the time of the discrepancy to investigate the primary measuring devices and report any non-compliance event.
12. OPG will not be required to provide raw level data. Instead the compliance and reporting requirements will be based on published data. Published data is part of OPG's official record of levels.

9.1.1.2 Flow Compliance - General Principles

The general principles applicable to the water flow portion of the compliance framework of the operational Plan are outlined below.

1. Flows are reported to three significant figures, but not more than one decimal place.
2. Compliance will be based on flows calculated at the locations specified in Table 9.03.
3. A published flow that is within 10 percent of a mandatory or conditional limit will not be considered out of compliance.
4. OPG may seek temporary relief from mandatory or conditional level limits specified in the WMP with MNR consent.
5. A incident will occur when the flow is outside of the mandatory or conditional requirements for a period of 10 minutes or more at one of the five OPG generating stations.
6. OPG will self-report any incident within one business day of the event being discovered.
7. OPG compliance and reporting requirements will be based on published data. Published data is part of OPG's official record of flows.

Table 9.03: Flow Compliance Calculations

Gauge Location	Calculation Interval (expected implementation 2009)
Bark Discharge	Once every 60 minutes
Palmer Rapids	As operated by Water Survey of Canada
Mountain Chute Total Turbine Discharge	Once every five minutes
Mountain Chute Total Discharge	Once every five minutes
Barrett Chute Total Turbine Discharge	Once every five minutes
Barrett Chute Total Discharge	Once every five minutes
Calabogie North Channel Discharge	Once every five minutes
Calabogie Total Discharge	Once every five minutes
Stewartville Total Turbine Discharge	Once every five minutes
Stewartville Total Discharge	Once every five minutes
Arnprior Total Turbine Discharge	Once every five minutes
Arnprior Total Discharge	Once every five minutes

OPG level and flow limits as well as the conditions required for conditional limits are specified in sub-section 9.3. The current gauge used to identify the location where the level or flow will be measured or calculated is also specified. Levels and flows specified as mandatory in tables of this sub-section are required whenever the conditions for conditional limits are not fulfilled. A list of required conditions of each conditional limit is also specified.

9.1.2 Waba Creek Compliance Framework

Due to the nature of the facilities on Waba Creek, and the lack of any ability to hold back water, the compliance framework is based on mandatory flow limits. MNR's White Lake Dam, which controls the flows in Waba Creek, has a low flow requirement that is specified in sub-section 9.5.1. The passing of this flow is the basis for the compliance framework for the Waba Creek facilities.

9.1.3 Bancroft Light and Power (BLP) Compliance Framework

The compliance framework for the BLP facility is based on mandatory level limits and is set out in the simplified BLP WMP. For a copy of the BLP WMP or for more information, contact BLP at (416) 386-0299 (Michael.mcleod@rcscanada.ca) or MNR's Bancroft District office.

9.2 MADAWASKA RIVER

9.2.1 Cache Lake - MNR Algonquin Park

The compliance framework for MNR facilities on the Madawaska River does not require the use of mandatory level or flow limits. The level of Cache Lake is usually maintained between 92.5 and 95.25 feet LD. The annual variation of the operating band is shown in Figure 9.01.

The typical annual mode of operation of the Cache Lake Dam is summarized in Table 9.04.

Table 9.04: Cache Lake Dam Operating Regime

Season	Operation
Spring	One log is replaced following the spring freshet
Summer	Eight logs are used throughout the summer to maintain minimum summer elevation of 93.5 feet (LD)
Fall	One log is pulled after Labour Day
Winter	The lake is maintained at 92.5 feet throughout the winter

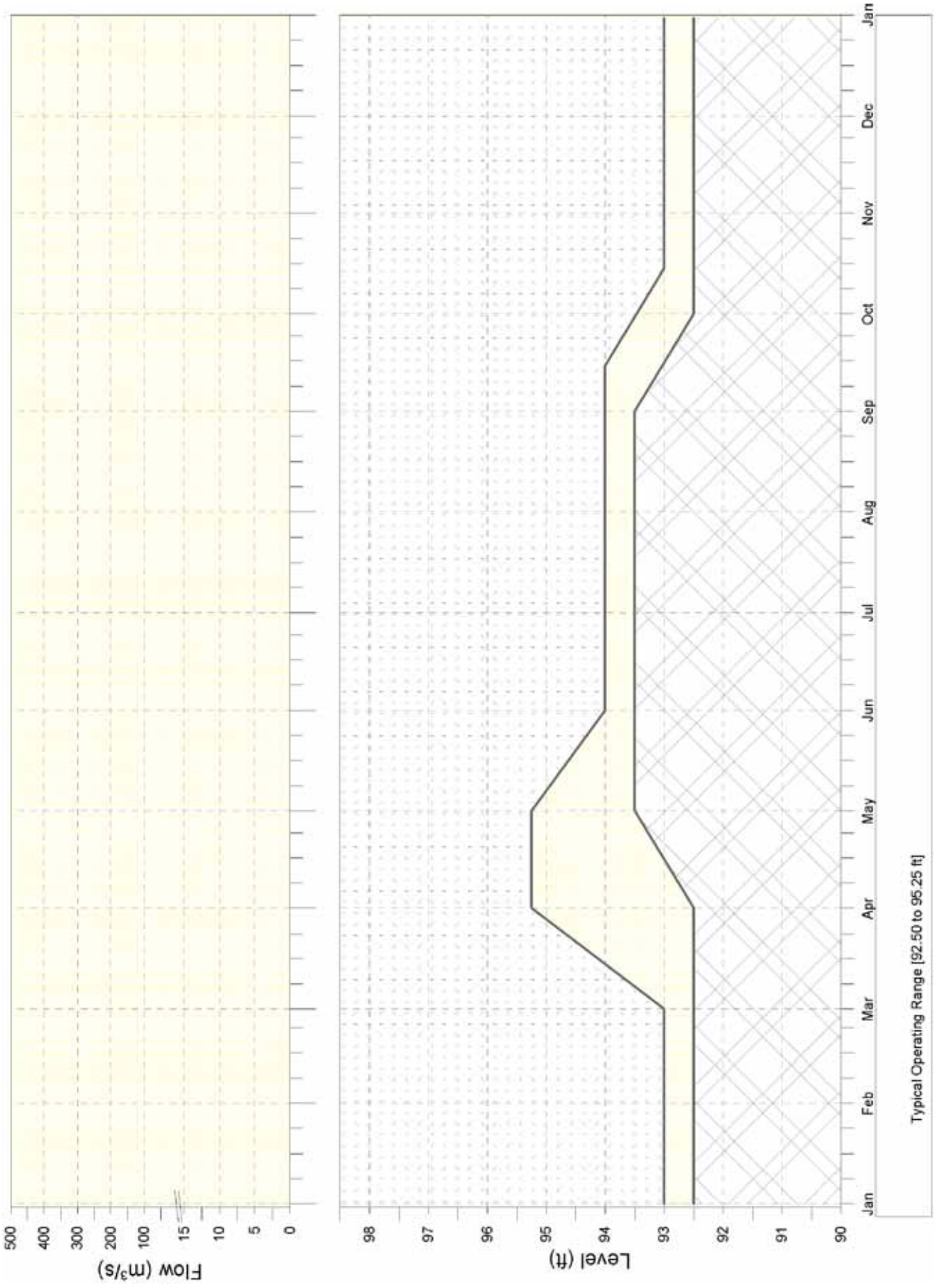


Figure 9.01: Cache Lake Operating Band

9.2.2 Lake of Two Rivers - MNR Algonquin Park

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Lake of Two Rivers is usually maintained between 87 and 89 feet LD. The annual variation of the operating band is shown in Figure 9.02

The typical annual mode of operation of the Lake of Two Rivers Dam is summarized in Table 9.05.

Table 9.05: Lake of Two Rivers Dam Operating Regime

Season	Operation
Spring	Logs are replaced following the spring freshet
Summer	Five logs are used to maintain the summer desired level of 88.0 feet (local datum)
Fall	The top tier of logs is removed after Labour Day and the lake is drawn down
Winter	The lake is maintained at 88.00 feet throughout the winter

9.2.3 Rock Lake - MNR Algonquin Park

This facility is not operated. There are no level or flow constraints.

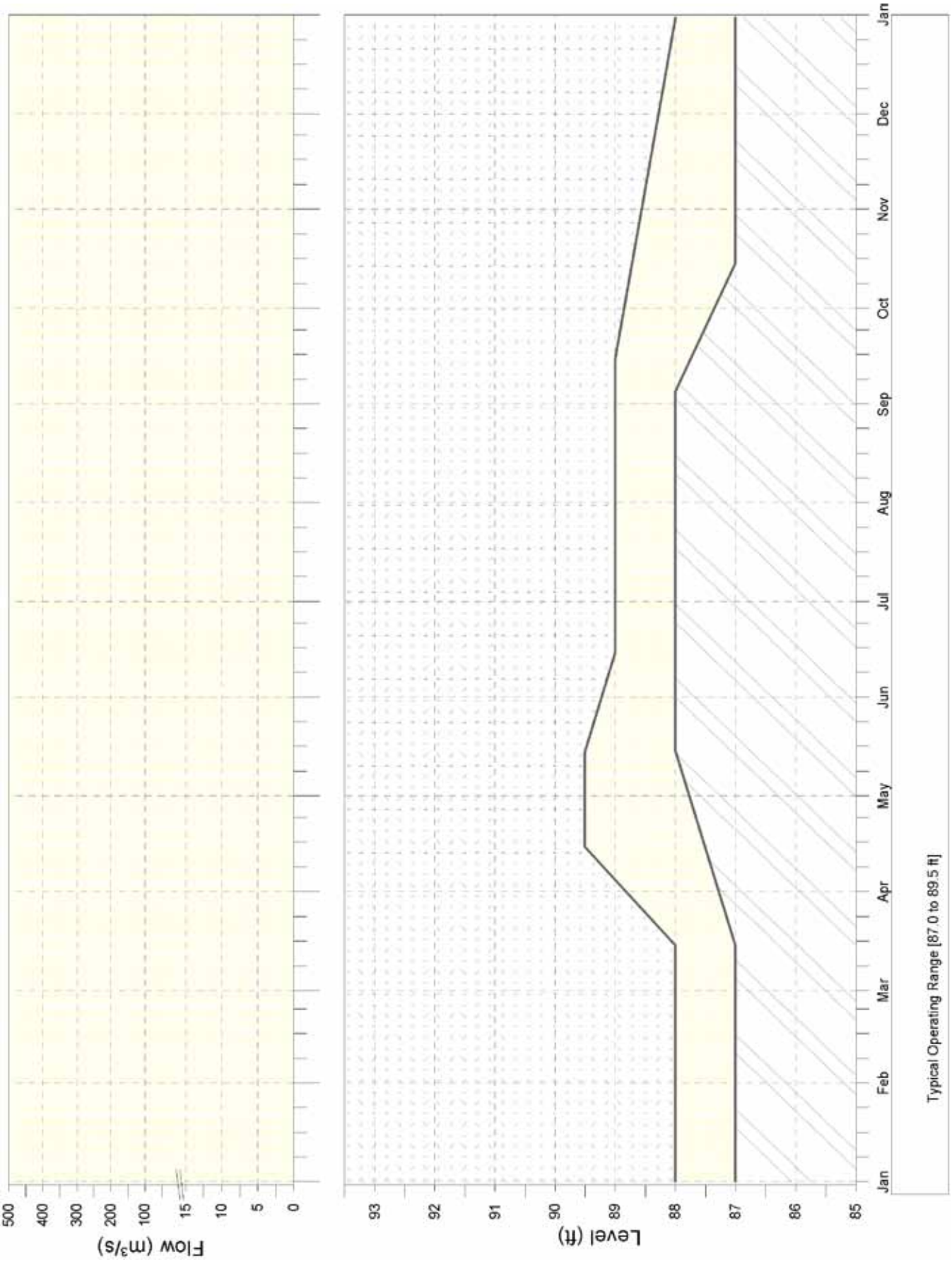


Figure 9.02: Lake of Two Rivers Operating Band

9.2.4 Galeairy - MNR Bancroft

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Galeairy Lake is usually maintained between 389.2 and 389.7 m CGD. The annual variation of the operating band is shown in Figure 9.03.

There are a number of fisheries concerns on Galeairy Lake and as such, consideration for fisheries is a priority in dam operations. Galeairy Lake is a naturally-reproducing lake trout lake. Lake trout spawn mid October in 1 - 1.5 metres of water on near-shore shoals. The drawdown of the lake must be completed prior to spawning to avoid exposing eggs to air or ice. The eggs hatch in mid-February with the fry emergence occurring in March to April. In addition, smallmouth bass are present in the lake and spawn mid to late May with the incubation of the eggs and guarding of the nests occurring in June. Whitefish spawn in November and walleye spawn in the Madawaska River in late April and the eggs hatch in late May.

The typical annual mode of operation of Galeairy Lake Dam is summarized in Table 9.06.

Table 9.06: Galeairy Lake Dam Operating Regime

Season	Operation
Spring	Daily inspection and log placements occur during the spring freshet. River flows are to be maintained during and following the walleye spawn in the Madawaska River.
Summer	Summer desired level is 389.6 m and in normal years there are minimal log adjustments during the summer period.
Fall	Lake trout require a drawdown in early September to 389.3 m.
Winter	Two logs are replaced per gate and the lake level is maintained at 389.5 m for the winter months.

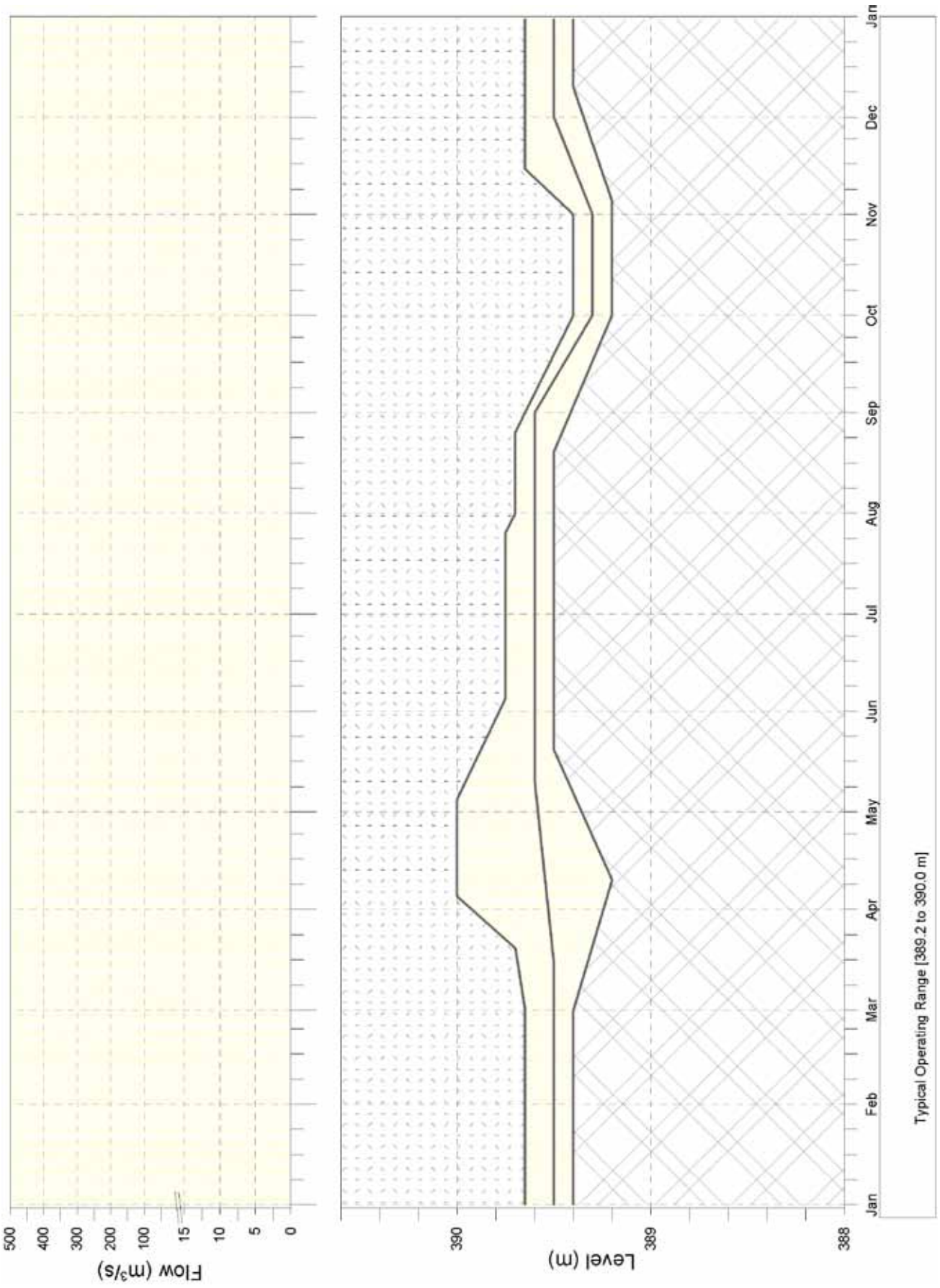


Figure 9.03: Galeairy Lake Operating Band

9.2.5 Bark Lake -OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Bark Lake are measured at gauge 02KD007 and are shown in Table 9.07.

Table 9.07: Bark Lake Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 313.94 m	Type: Mandatory maximum level
Absolute Minimum 304.50 m	Type: Mandatory minimum level Note: Once the elevation measured at gauge 02KD007 falls below 306.01 m a table is used to convert the elevation of Bark Lake to the Bark Lake proper elevation. Below 306.01 m, the Bark Lake Proper elevation will be used for compliance.
Summer Minimum 313.62 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided all five conditions outlined below are fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The total inflow into Bark Lake is more than 15 m^3/s during the walleye spawn period. 3. The total inflow into Bark Lake is more than 5 m^3/s during the walleye incubation period. 4. The seven-day moving average total inflow into Bark Lake is more than 8.7 m^3/s during the white-water release period. 5.The total inflow into Kamaniskeg Lake is more than 10 m^3/s. The implementation of the summer minimum may be delayed provided all of the three conditions outlined below are fulfilled. 1. The total inflow into Bark Lake is currently above 85 m^3/s or is expected to rise above 85 m^3/s in the next 10 days. 2. The level of Bark Lake has not exceeded 313.62 m since March 1 of the current year. 3. The date is no later than June 30. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an “Emergency Operating State” by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a “3% Voltage Reduction” by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Bark Lake are not active. 6. Summer drawdown during an emergency water release is restricted to 0.20 m per day. 7. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Normal Minimum 304.80 m	Type: Conditional Requirement The water in storage below normal minimum can be utilized provided all six conditions outlined below have been addressed. 1. Declaration of an emergency operating state by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a 3% voltage reduction by the IESO. 4. Within 24 hours after the end of an emergency operating state, the level will be returned to the required minimum level. 5. Walleye spawn/incubation flow limits at Bark Lake are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.

Table 9.07: Bark Lake Mandatory and Conditional Level Limits Continued

Spring Redraw 0.20 m	Type: Conditional Requirement The water level must not be redrawn until such a time that the following four conditions have been fulfilled. 1. The date is within the spring refill period. The spring refill period starts on April 1 and ends when the level of Bark Lake reaches the summer minimum (313.62 m) or the start of the summer period. 2. The total inflow into Bark Lake is less than 20 m^3/s at the same time that the elevation is below 308.20 m. 3. The walleye spawn/incubation flow limits at Bark Lake are active and the three day average inflow is greater than conditional flow requirements. 4. The level of Kamaniskeg Lake is expected to exceed the operating maximum level of 283.46 m in the next ten days. The redraw will be considered a non-compliance event if the level is drawn more than 0.20 m. A draw of more than 0.20 m is considered a violation of this constraint.

Mandatory and conditional flow limits at Bark Lake are determined from gauge 02KD007B and are shown in Table 9.08.

The annual variation of the mandatory and conditional limits as well as notes of interest are shown in Figure 9.04.

Table 9.08: Bark Lake Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 2.8 m^3/s	Type: Mandatory Minimum Instantaneous flow Periodically OPG does carry out work that requires short periods of zero flow from the dam. OPG will seek MNR|DFO approval for any zero flow conditions. This flow limit is an instantaneous flow that must be maintained at all times.
Minimum Walleye Spawning & Incubation Flow 15 m^3/s	Type: Conditional Requirement The minimum walleye spawning flow is required when the following three conditions apply. 1. The water temperature measured at Bells Rapids or an agreed upon location has reached 6 ^0C. 2. MNR has confirmed significant walleye activity at Bells Rapids. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. The minimum walleye incubation flow is required when the following three conditions apply. 1. MNR has confirmed the end of the walleye spawn period and the start of the incubation period. 2. The level of Bark Lake is currently above the summer minimum of 313.62 m. 3. The total inflow into Bark Lake is greater than 15 m^3/s. This flow limit is an instantaneous flow that must be maintained throughout the walleye spawning period.
Minimum Walleye Incubation Flow 5 m^3/s	Type: Conditional Requirement The minimum walleye incubation flow will depend on the following three conditions being met. 1. MNR has confirmed the end of the walleye spawn period and the start of the incubation period. 2. The total inflow into Bark Lake is equal to or less than 15 m^3/s. 3. The level of Bark Lake is expected to be below the summer minimum of 313.62 m within the next four days.
Flood Threshold 150 m^3/s	Note of interest This flow threshold is not a compliance limit. Flows of 150 m^3/s or more can cause flooding out of low-lying docks.
White-water Minimum Flow 25.6 m^3/s	Note of interest This minimum flow is not a compliance limit. The recreational flow is released according to the following guidelines. 1. The date is within the white-water release period. The white-water release period starts on the Monday of the week of Mid May and ends on a Thursday of the last partial week of August. 2. The day of the week is Monday to Thursday, excluding statutory holidays. 3. The time of the release is 08:00 to 14:00 EST. Log operations commence 45 minutes prior to the start time and 30 minutes prior to the end time. 4. When water management strategies require a release greater than 26 m^3/s flows are not reduced during release time to provide for ideal white-water conditions. 5. Flow releases are set at: a) 26 hours per week when Bark Lake is above 313.62 m. b) 18 hours per week when Bark Lake is between 313.62 and 313. 50 m. c) 0-18 hours as required for downstream minimum flows when Bark Lake is below 313.50 m.

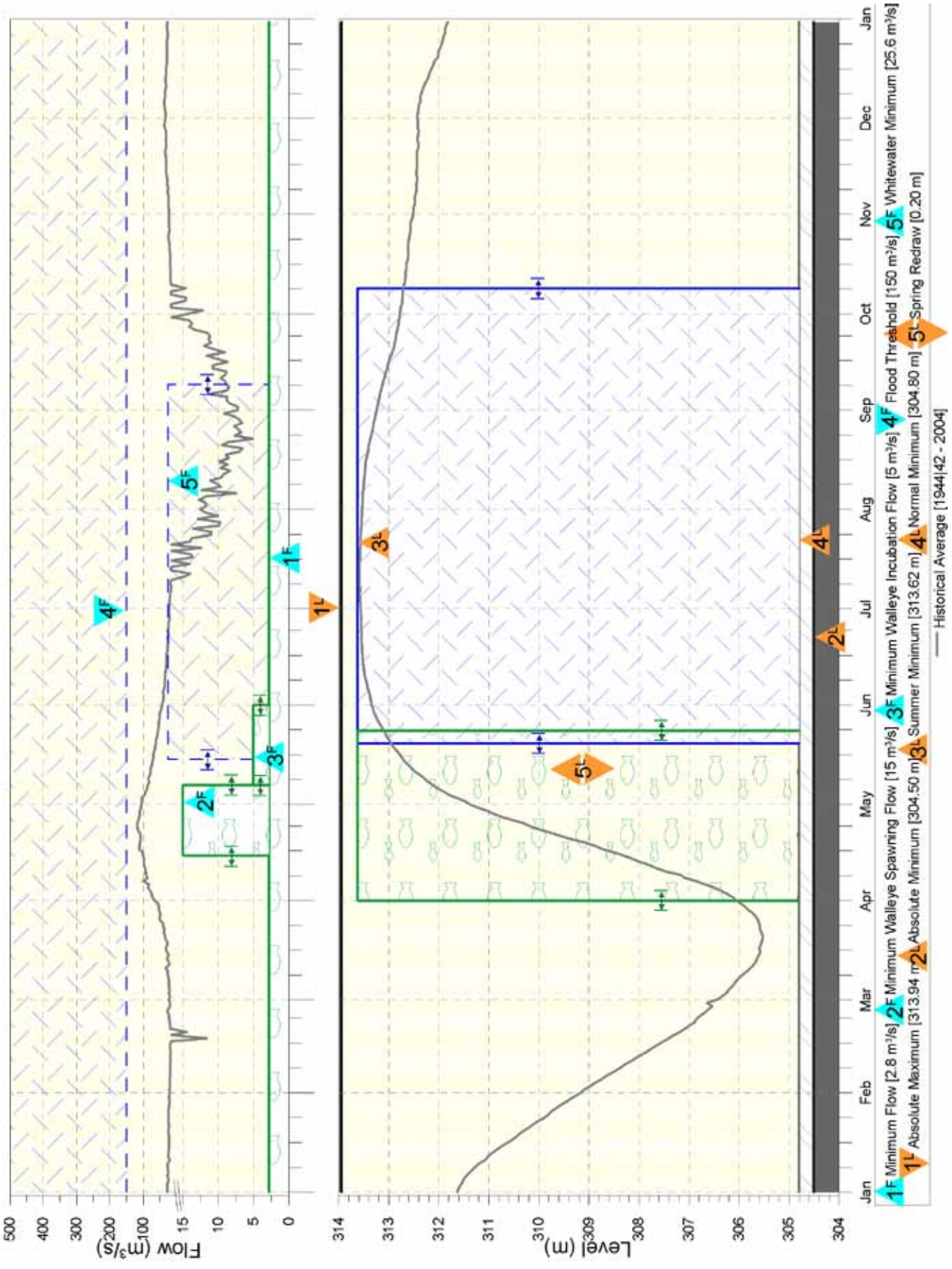


Figure 9.04: Bark Lake Flow and Level Constraints

9.2.6 Palmer Rapids (Kamaniskeg Lake) - OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Kamaniskeg Lake are measured at gauge 02KD052 as well as 02KD055A and are shown in Table 9.09. Gauge 02KD055A is used for monitoring compliance with the Muskrat Range, while gauge 02KD052 is used for all other level compliance.

Table 9.09: Palmer Rapids (Kamaniskeg Lake) Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 283.46 m	Type: Conditional Requirement The specified maximum level is the applicable limit provided the conditions outlined below have been fulfilled. 1. The total inflow into Kamaniskeg Lake is or has exceeded 350 m^3/s. 2. A reasonable effort has been made to remove all available logs from Palmer Rapids dam. 3. OPG will notify MNR once there is a reasonable probability that the level will exceed 283.46 m.
Absolute Minimum 282.24 m	Type: Mandatory Minimum level
Summer Maximum 283.09 m	Type: Conditional Requirement The specified maximum level is the applicable limit provided both conditions outlined below are fulfilled. 1.The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The total inflow into Kamaniskeg Lake is less than 250 m^3/s. The implementation of the summer maximum may be delayed due to the following reasons: 1. The total inflow into Kamaniskeg Lake is currently above 160 m^3/s or is expected to rise above 160 m^3/s in the next ten days. 2. The date is no later than June 30.
Summer Minimum 282.91 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided both conditions outlined below have been met. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The total inflow into Kamaniskeg Lake is between 10 m^3/s and 250 m^3/s. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an “Emergency Operating State” by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a “3% Voltage Reduction” by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Muskrat Range 0.12 m	Type: Conditional Requirement The specified range is the applicable limit provided the following conditions outlined below are fulfilled. Gauge 02KD055A is used to monitor this conditional requirement. 1. The date is within the winter period. The winter period starts once an ice cap has formed over Conroy’s Marsh. The winter period ends once the main channel of the York River is open. 2. The total inflow into Kamaniskeg Lake is less than 180 m^3/s. High inflows (180 m^3/s or greater) during winter thaw periods will suspend the 12 cm winter operating range. The Strategy for the Muskrat Range is outlined below. 1.Target an Upper Gauge level of 282.85 m by the start of the winter period. 2.Calculate the mid-point level of the winter operating range by subtracting 0.03 m from the elevation of the Upper Gauge at the time of freeze up. 3. Maintain the Upper Gauge within +/- 0.06 m of the mid-point of the winter operating range until the end the winter period.

Mandatory and conditional flow limits at Kamaniskeg Lake are determined from gauge 02KD004 and are shown in Table 9.10. Gauge 02KD004 is operated by the Water Survey of Canada.

Table 9.10: Palmer Rapids (Kamaniskeg Lake) Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 10 m^3/s	Type: Mandatory Minimum Instantaneous flow Periodically OPG does carry out work that requires short periods of zero flow from the dam. OPG will seek MNR|DFO approval for any zero flow conditions. This flow limit is an instantaneous flow that must be maintained at all times. The water level gauge used to calculate the flow is operated by the Water Survey of Canada.
White-water Minimum Flow 23.6 m^3/s	Note of interest This minimum flow is not a compliance limit. Log operations are not carried out to provide the desired recreational flow. The minimum recreational is achieved when the total inflow is at or above the 23.6 m^3/s threshold.

The annual variation of the mandatory and conditional limits as well as notes of interest are shown in Figure 9.05.

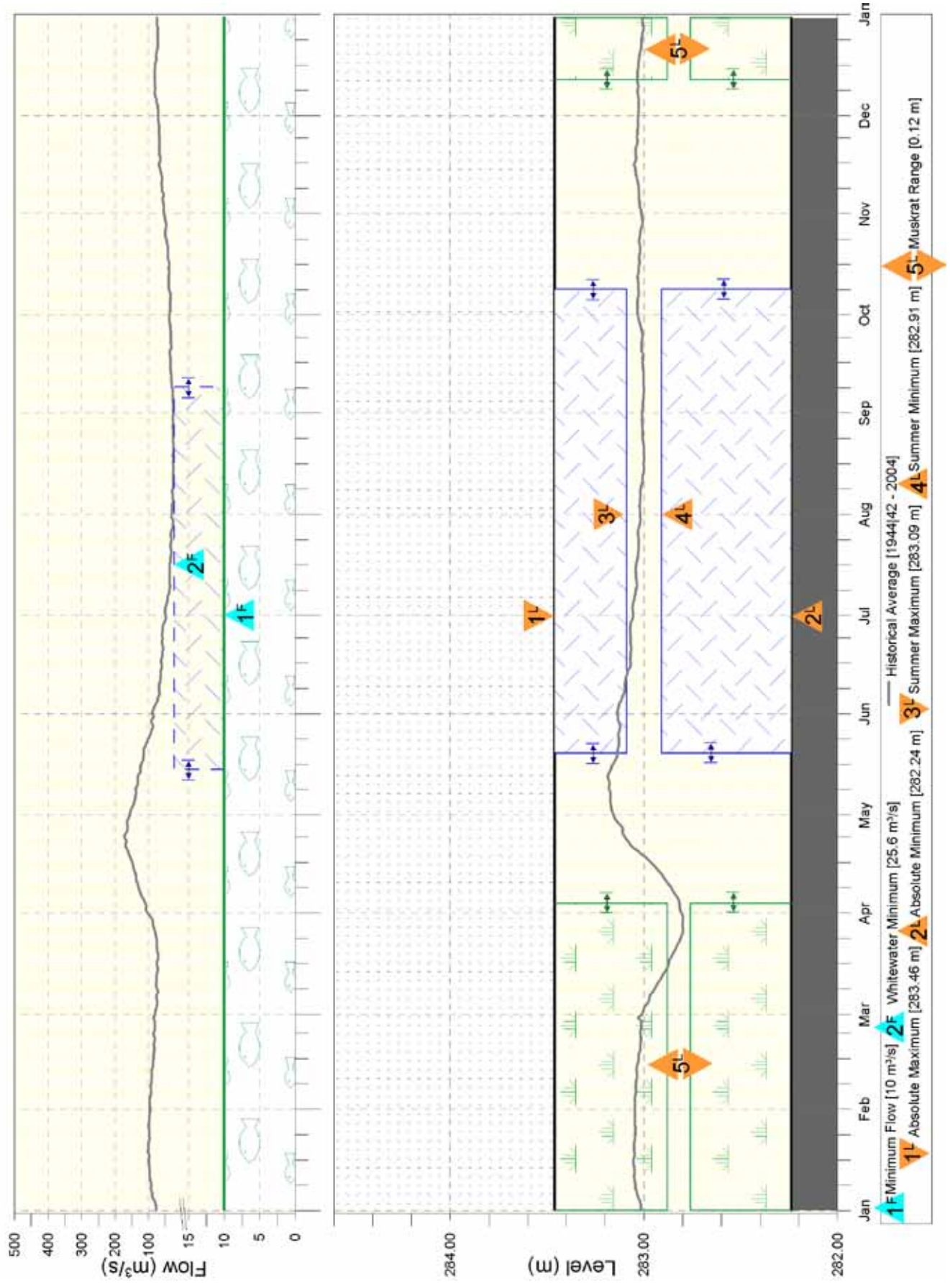


Figure 9.05: Palmer Rapids (Kamaniskeg Lake) Flow and Level Constraints

9.2.7 Mountain Chute GS - OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Mountain Chute GS are measured at gauge 02KD056 and are shown in Table 9.11.

Table 9.11: Mountain Chute Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 248.40 m	Type: Mandatory Maximum level
Absolute Minimum 243.54 m	Type: Mandatory Minimum level
Flood Maximum 249.00 m	Type: Conditional Requirement The primary purpose of this additional flexibility is to provide water storage capabilities to reduce peak flows during periods of significant downstream flooding.The level may rise to the flood storage maximum provided any of the following conditions outlined below are fulfilled. 1. The level of Chats Lake has exceeded or is expected to exceed the serious damage threshold of 75.50 m in the next 10 days. 2. The level of Britannia has exceeded or is expected to exceed the serious damage threshold of 60.00 m in the next 10 days. 3. The level of Gatineau/Hull has exceeded or is expected to exceed the serious damage threshold of 44.20 m in the next 10 days. 4. Walleye spawn / Incubation limit at the Mountain Chute are active and spill is expected to have a significant negative impact on the spawning grounds in the Mountain Chute tailrace. 5. Allow for the completion of public safety inspections on spillways from Mountain Chute to Arnprior.
Normal Minimum 243.80 m	Type: Conditional Requirement The water in storage below the normal minimum can be utilized provided all seven conditions outlined below have been addressed. 1. Declaration of an Emergency Operating State by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a 3% voltage reduction by the IESO. 4. Within 24 hours after the end of an emergency operating state, the level will be returned to the required minimum level. 5. Walleye spawn/incubation flow limits at Mountain Chute are not active (excluding the Mountain Chute tail race). 6. Spring redraw limit at the Mountain Chute are not active. 7. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.

Table 9.11: Mountain Chute Mandatory and Conditional Level Limits Continued

Parameter	Limit Type, Conditions and Notes
Summer Minimum 247.80 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided both conditions outlined below are fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The three-day moving average total inflow into Mountain Chute is more than 70 m^3/s. The specified minimum level is further restricted to 248.00 m provided both conditions outlined below are fulfilled. 1.The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The three-day moving average total inflow into Mountain Chute is equal to or less than 70 m^3/s. The implementation of the summer minimum may be delayed provided all of the three conditions outlined below are fulfilled. 1.The total inflow into Mountain Cute is currently above 190 m^3/s or is expected to rise above 190 m^3/s in the next 10 days. 2. The level of Mountain Chute has not exceeded 247.80 m since March 1 of the current year. 3. The date is no later than June 30. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an "Emergency Operating State" by the IESO 2. IESO requests market participants to seek approval for environmental variances 3. Implementation of a "3% Voltage Reduction" by the IESO 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Mountain Chute are not active. 6. Summer drawdown during an emergency water release is restricted to 0.20 m per day. 7. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Spring Redraw 0.20 m	Type: Conditional Requirement The water level must not be redrawn provided all of the conditions outlined below are fulfilled. 1. The date is within the spring refill period. The spring refill period starts on April 1 and ends when the level of Mountain Chute reaches the summer minimum (247.80 m) or the start of the summer period. 2. The walleye spawn flow limits at Mountain Chute are active and the three-day average inflow is greater than the conditional flow requirements. 3. Any of the following sub-conditions have occured: a)The level of Chats Lake has exceeded or is expected to exceed the serious damage threshold of 75.50 m in the next 10 days. b)The level of Britannia has exceeded or is expected to exceed the serious damage threshold of 60.00 m in the next 10 days. c) The level of Gatineau/Hull has exceeded or is expected to exceed the serious damage threshold of 44.20 m in the next 10 days The redraw will be considered a non-compliance event if the level at 24:00 is drawn more than 0.20 m. A draw of more than 0.20 m is considered a violation of this constraint.

Mandatory and conditional flow limits at Mountain Chute GS are shown in Table 9.12. Published flows for Mountain Chute are calculated using a number of measured quantities.

Table 9.12: Mountain Chute Mandatory and Conditional Flow Limits

Flow Constraints	
Parameter	Limit Type, Conditions and Notes
Walleye Spawn 100 m^3/s	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all of the three conditions below have been met. 1. The water temperature measured in the Mountain Chute tailrace or an agreed-upon location has reached 6 ^0C. 2. MNR has confirmed significant walleye activity at Mountain Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period.This flow limit is an instantaneous flow to attract fish to the spawning grounds that must be maintained throughout the walleye spawning period between the hours of 19:00 to 23:00 EST.

The annual variation of the mandatory and conditional limits are shown in Figure 9.06.

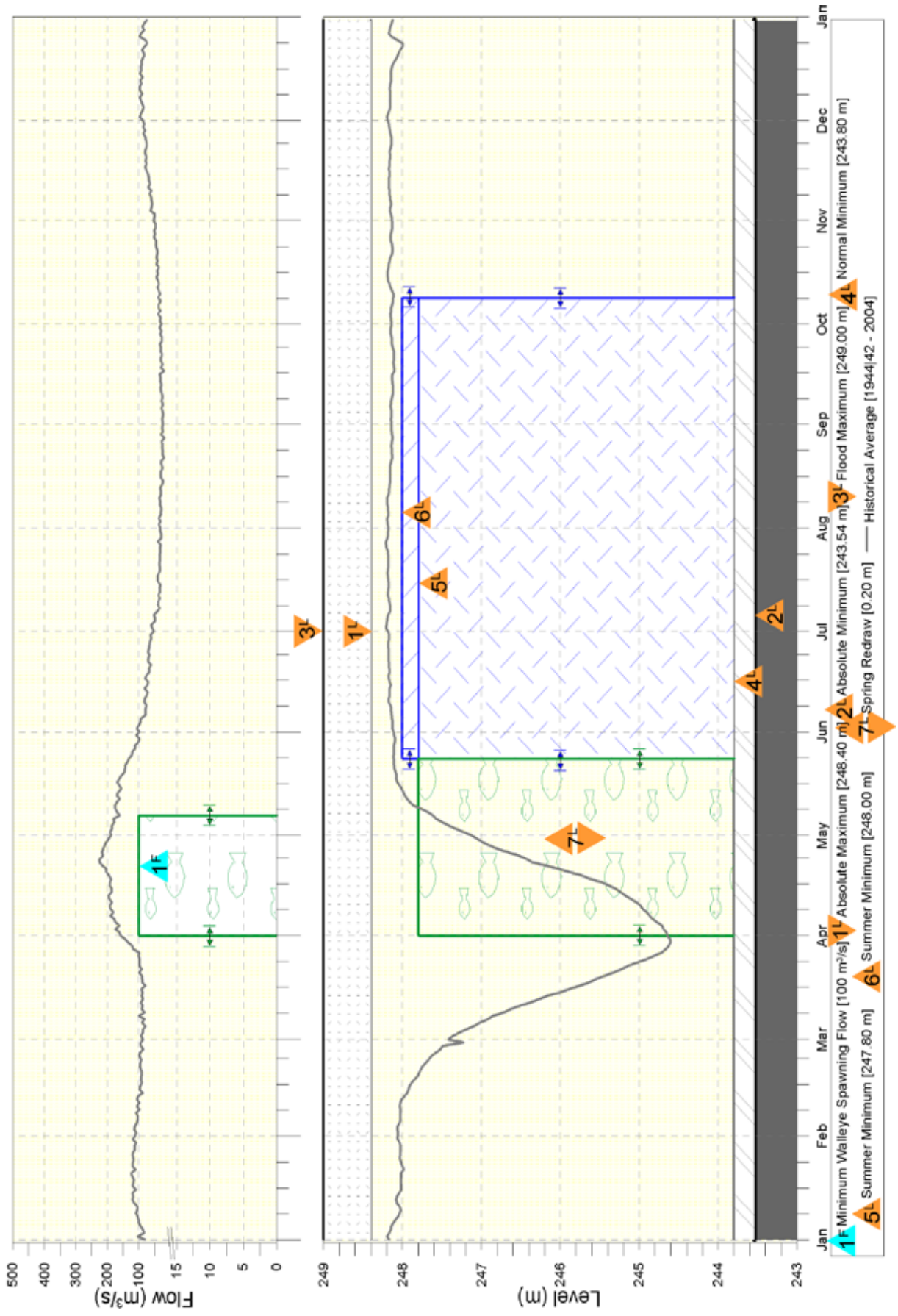


Figure 9.06: Mountain Chute GS Flow and Level Constraints

9.2.8 Barrett Chute GS - OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Barrett Chute GS are measured at gauge 02KE051 and are shown in Table 9.13.

Table 9.13: Barrett Chute Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 201.17 m	Type: Mandatory Maximum level
Absolute Minimum 198.73 m	Type: Mandatory Minimum level
Summer Minimum 200.70 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided the following condition outlined below is fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an “Emergency Operating State” by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a “3% Voltage Reduction” by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Barrett Chute are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Walleye Spawn & Incubation Minimum 200.70 m	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all four conditions have been met. 1. The water temperature measured in the Mountain Chute tailrace or an agreed-upon location has reached 6 ^{0}C. 2. MNR has confirmed significant walleye activity at Mountain Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. 4. The water temperature degree days since the start of the incubation period is less than 205 ^{0}C.

Mandatory and conditional flow limits at Barrett Chute GS are shown in Table 9.14. Published flows for Barrett Chute GS are calculated using a number of measured quantities.

Table 9.14: Barrett Chute Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Walleye Spawn 40 m^3/s	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all the three conditions outlined below are fulfilled. 1. The water temperature measured in the Barrett Chute tailrace or an agreed upon location has reached 6 ^{0}C. 2. MNR has confirmed significant walleye activity at Barrett Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period.This flow limit is an instantaneous flow to attract fish to the spawning grounds that must be maintained throughout the walleye spawning period between the hours of 19:00 to 23:00 EST.

The annual variation of the mandatory and conditional limits are shown in Figure 9.07.

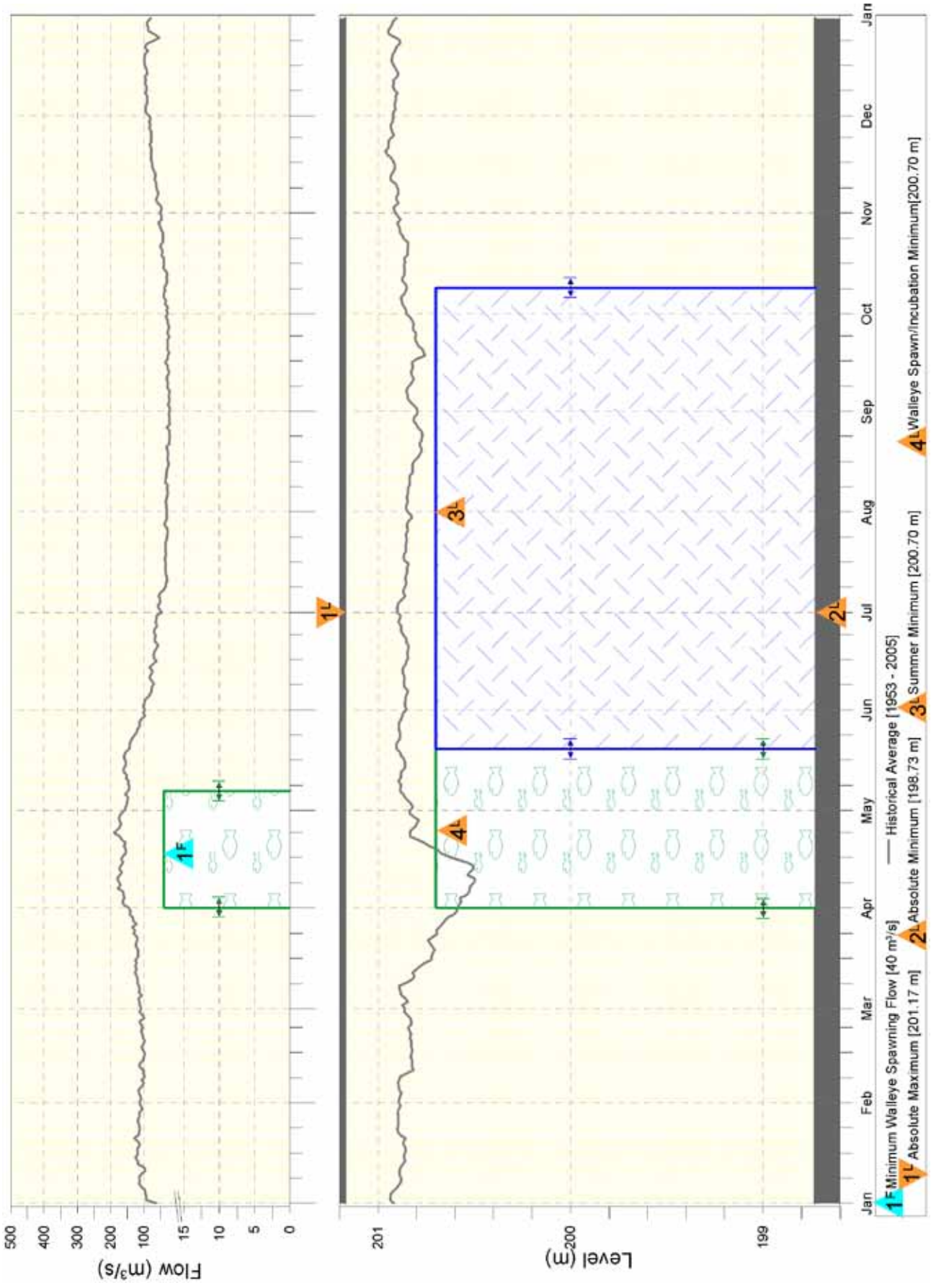


Figure 9.07: Barrett Chute GS Flow and Level Constraints

9.2.9 Calabogie GS – OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Calabogie GS are measured at gauge 02KE052 and are shown in Table 9.15.

Table 9.15: Calabogie GS Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 154.17 m	Type: Mandatory Maximum level
Absolute Minimum 153.56 m	Type: Mandatory Minimum level
Summer Minimum 153.80 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided the following condition outlined below is fulfilled. 1.The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an “Emergency Operating State” by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a “3% Voltage Reduction” by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Calabogie are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Walleye Spawn & Incubation Maximum 154.05 m	Type: Conditional Requirement The maximum level is applicable provided all the four conditions outlined below are fulfilled. The maximum level is to protect spawning grounds in Constant Creek. 1.The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 ^{0}C. 2.MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3.MNR has provided 24 hours notice of the start of the walleye spawning period. 4.The water temperature degree days since the start of the incubation period is less than 205 ^{0}C.
Walleye Spawn & Incubation Minimum 153.80 m	Type: Conditional Requirement The minimum level is applicable provided all the four conditions outlined below have been met. 1. The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 ^{0}C. 2. MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. 4. The water temperature degree days since the start of the incubation period is less than 205 ^{0}C.

Mandatory and conditional flow limits at Calabogie GS are shown in Table 9.16. Published flows for Calabogie GS are calculated using a number of measured quantities.

Table 9.16: Calabogie GS Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 0.8 m^3/s	Type: Mandatory Minimum Level Note:This flow has not been measured since the replacement of the wooden stop logs with steel stop logs. The 0.8 m^3/s is an estimated flow.
Walleye Spawn & Incubation 5 m^3/s.	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all the three conditions outlined below are fulfilled. 1. The water temperature measured in the North Channel at Calabogie or an agreed-upon location has reached 6 ^0C. 2. MNR has provided 24 hours notice of the start of the walleye spawning period. 3. The water temperature degree days since the start of the incubation period is less than 205 ^0C.This flow limit is an instantaneous flow that must be maintained throughout the walleye spawning period.

The annual variation of the mandatory and conditional limits are shown in Figure 9.08.

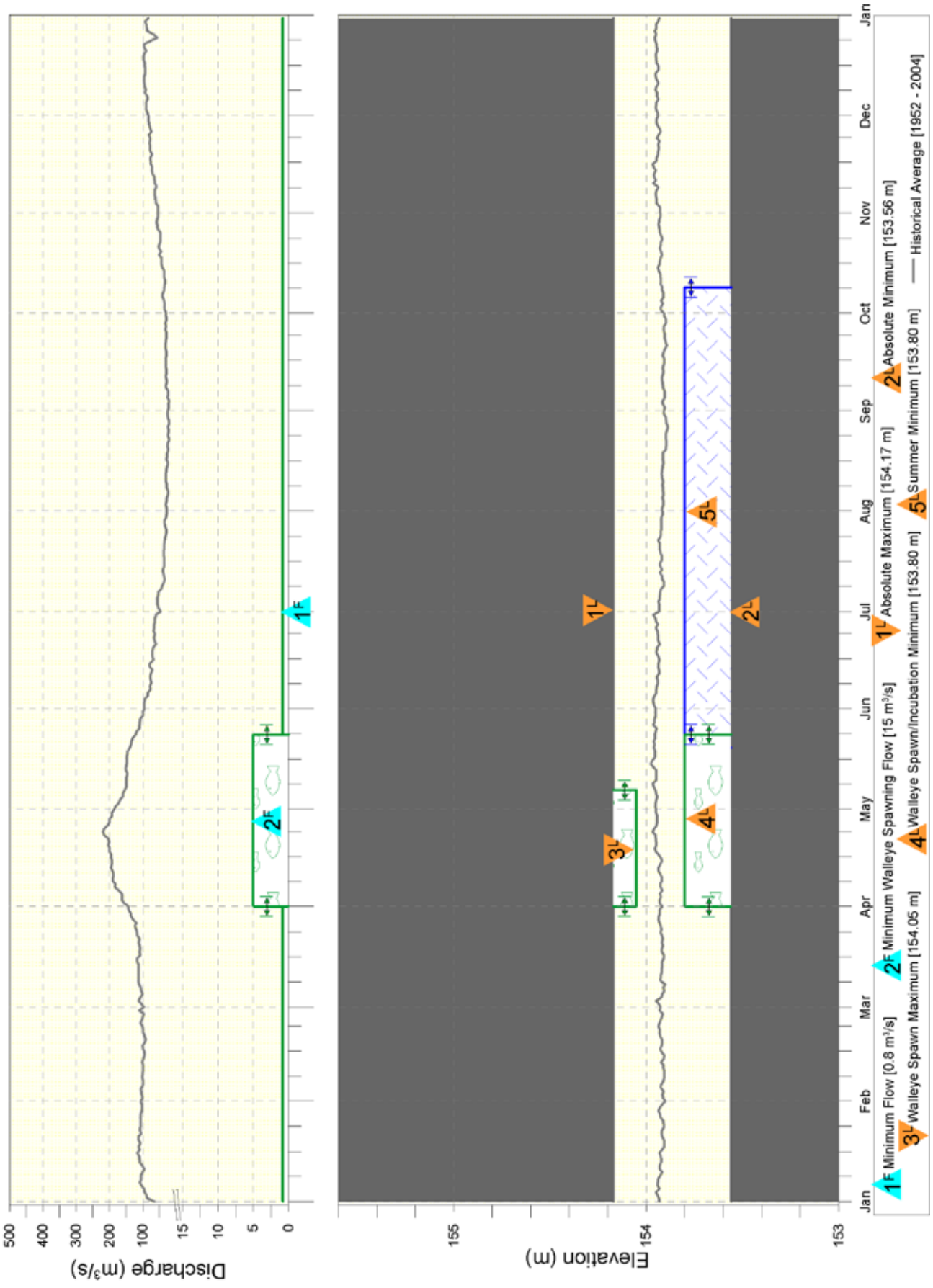


Figure 9.08: Calabogie GS Flow and Level Constraints

9.2.10 Stewartville GS - OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Stewartville GS are measured at gauge 02KE005 and are shown in Table 9.17.

Table 9.17: Stewartville GS Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 144.78 m	Type: Mandatory Maximum level
Absolute Minimum 142.65 m	Type: Mandatory Minimum level
Normal Minimum 143.50 m	Type: Conditional Requirement The water in storage below normal minimum can be utilized provided all seven conditions outlined below are fulfilled. 1. Declaration of an emergency operating state by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a 3% voltage reduction by the IESO. 4. Within 24 hours after the end of an emergency operating state, the level will be returned to the required minimum level. 5. Walleye spawn/incubation flow limits at Stewartville are not active. 6. Pike spawn/incubation flow limits at the Stewartville are not active. 7. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Summer Minimum 144.48 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided the condition outlined below is fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. The specified minimum level is reduced to 144.00 m provided the following conditions outlined below are fulfilled. 1. The three-day moving average total inflow into Mountain Chute is equal to or more than 53.6 m^3/s and is expected to remain above 53.6 m^3/s for the current calendar day. 2. The total discharge from Mountain Chute, Barrett Chute, Calabogie and Stewartville is equal to or more than 53.6 m^3/s. 3. The instantaneous discharge from Calabogie during the calendar day (00:00 to 24:00 EST) is equal to or more than 50 m^3/s. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an “Emergency Operating State” by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a “3% Voltage Reduction” by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Stewartville are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Pike Minimum 144.00 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided the condition outlined below has been met. 1. The date is within the pike spawn\incubation period. The spawn period starts on April 1, 00:00 EST and continues until the start of the summer minimum on Victoria Day weekend.

Mandatory and conditional flow limits at Stewartville GS are shown in Table 9.18. Published flows for Stewartville GS are calculated using a number of measured quantities.

Table 9.18: Stewartville GS Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Walleye Spawn 45 m^3/s	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all the three conditions outlined below are fulfilled. 1. The water temperature measured in the Stewartville tailrace or an agreed-upon location has reached 6 ^0C. 2. MNR has confirmed significant walleye activity at the Stewartville spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. This flow limit is an instantaneous flow to attract fish to the spawning grounds that must be maintained throughout the walleye spawning period between the hours of 19:00 to 23:00 EST.

The annual variation of the mandatory and conditional limits are shown in Figure 9.09.

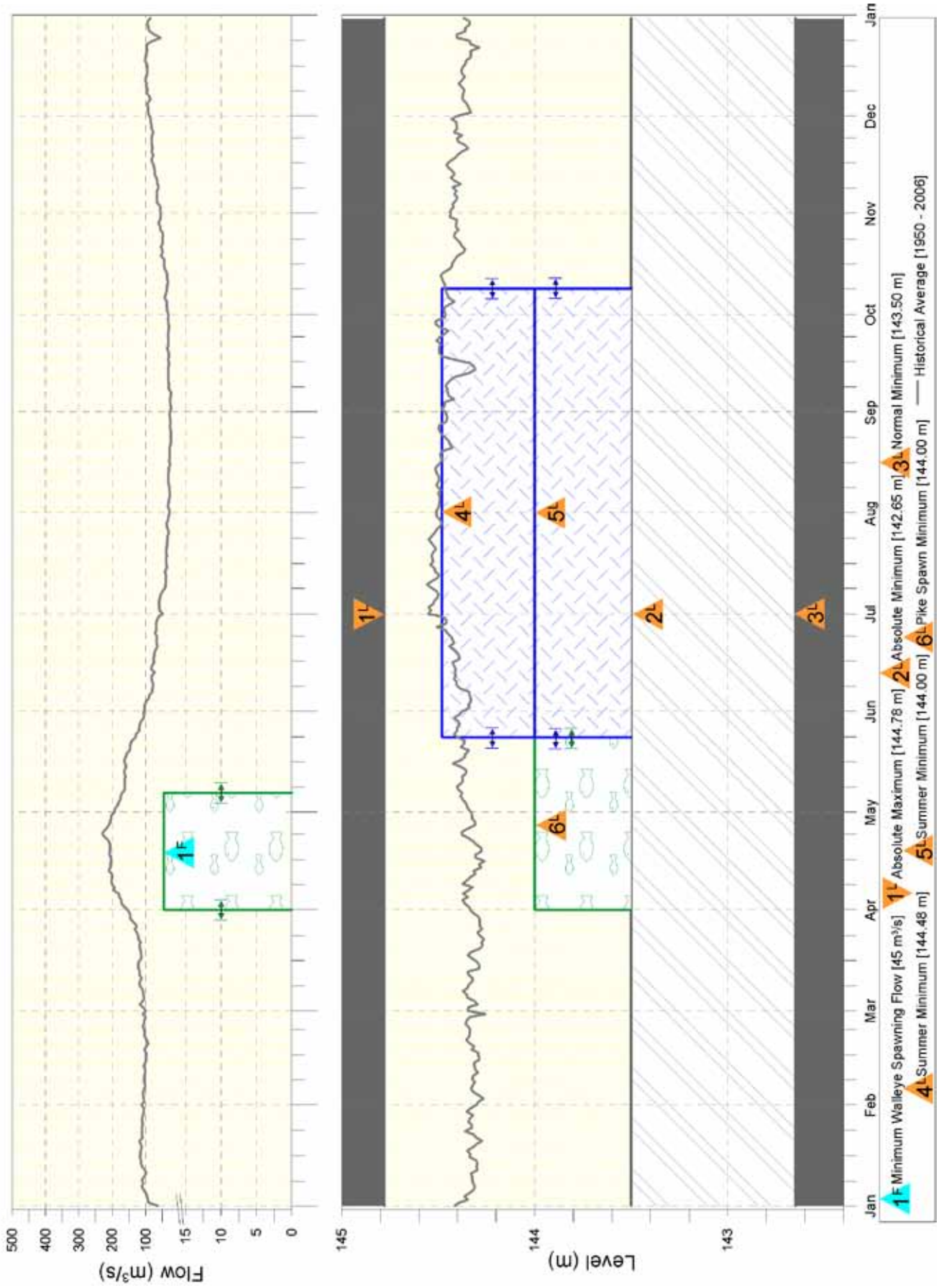


Figure 9.09: Stewartville GS Flow and Level Constraints

9.2.11 Arnprior GS - OPG

The level and flow compliance framework selected for the OPG facilities on the Madawaska River consists of mandatory level and flow limits as well as conditional limits. Mandatory limits are required unless a specified condition exists that requires further restrictions or allows for greater flexibility. The selection of the applicable constraining limit requires the evaluation of conditions such as the quantity of flow, presence of a certain species of fish or a specified water temperature. Mandatory and conditional level limits at Arnprior GS are measured at gauge 02KE054 and are shown in Table 9.19.

Table 9.19: Arnprior GS Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 99.06 m	Type: Mandatory Maximum level
Absolute Minimum 98.45 m	Type: Mandatory Minimum level
Normal Minimum 98.76 m	Type: Conditional Requirement The water in storage below the normal minimum can be utilized provided all six conditions outlined below are fulfilled. 1. Declaration of an emergency operating state by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a 3% voltage reduction by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the required minimum level. 5. Walleye spawn/incubation flow limits at Stewartville are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.

Mandatory and conditional flow limits at Arnprior GS are shown in Table 9.20. Published flows for Arnprior GS are calculated using a number of measured quantities.

Table 9.20: Arnprior GS Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 8.3 m^3/s	Type: Mandatory Minimum Flow This minimum flow is must satisfy all conditions outlined below. 1. A minimum daily average flow of 8.3 m^3/s. 2. A minimum flow of 200 m^3/s for a period of at least one hour. 3. No two consecutive periods of operation spaced greater than 24 hours apart.
Maximum Summer 270 m^3/s	Type: Conditional Requirement This maximum flow limit is an instantaneous flow that must not be exceed at any point during provided all the conditions outlined below are fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. 2. The daily average total inflow into Mountain Chute is greater than 180 m^3/s. 3. The daily average total inflow into Arnprior is expected to be greater than 180 m^3/s. 4. The 270 m^3/s is based on one unit discharge at maximum gate. The flow may vary based on the actual headwater level and will not be considered a non-compliant event provided no more than one unit is discharging any water at a given point in time.

The annual variation of the mandatory and conditional limits are shown in Figure 9.10.

9.2.12 Arnprior Weir - OPG

This facility is not operated. There are no level or flow constraints.

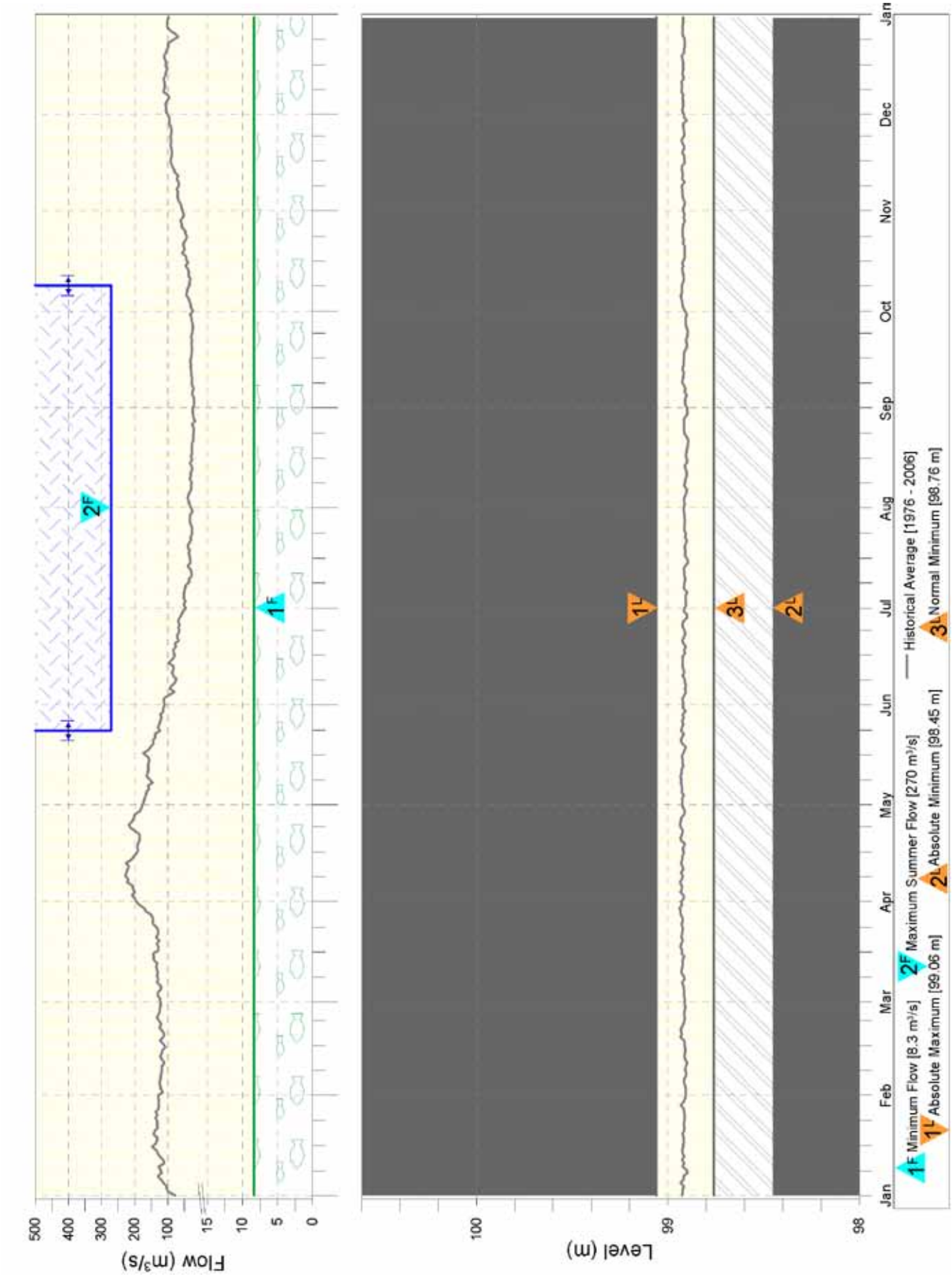


Figure 9.10: Arnprior GS Flow and Level Constraints

9.3 OPEONGO RIVER TRIBUTARY

9.3.1 Opeongo Lake - MNR Algonquin Park

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Opeongo Lake is usually maintained between 93.5 and 96.0 feet LD. The annual variation of the operating band is shown in Figure 9.11.

The typical annual mode of operation of the Opeongo Lake is summarized in Table 9.21.

Table 9.21: Opeongo Lake Operating Regime

Season	Operation
Spring	Logs are replaced following the freshet
Summer	Five logs are used to maintain the summer desired level of 94.5 feet
Fall	The top tier of logs is pulled after Labour Day
Winter	The lake is drawn down and maintained at 93.50 feet throughout the winter

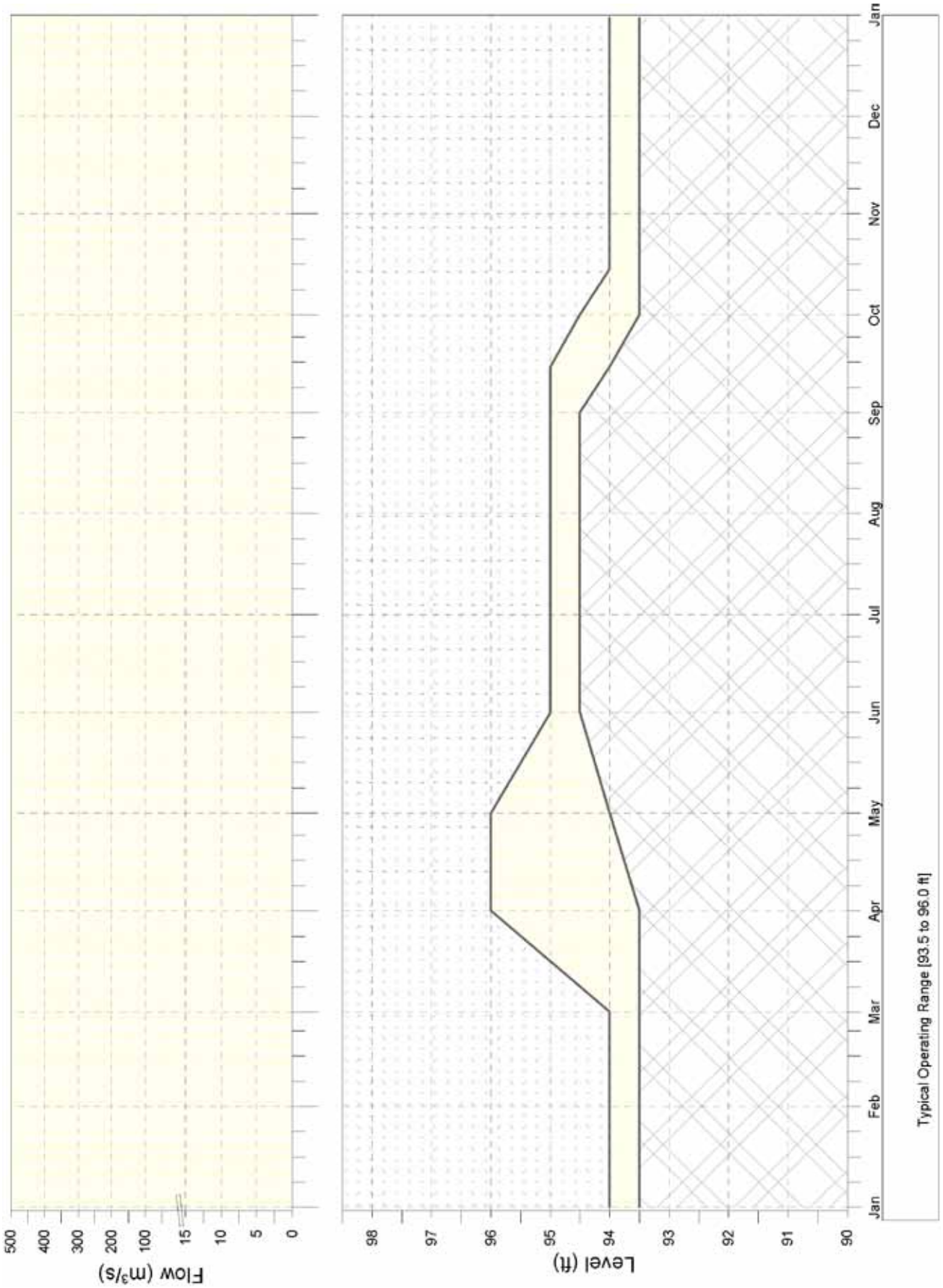


Figure 9.11: Opeongo Lake Operating Band

9.3.2 Booth Lake - MNR Algonquin Park

This facility is not operated. There are no level or flow constraints.

9.3.3 Shirley Lake - MNR Algonquin Park

Rock-filled dam upstream of original dam acts as a weir. This facility is not operated. There are no level or flow constraints.

9.3.4 Crotch Lake - MNR Algonquin Park

This facility no longer exists. The remnants of this facility are not expected to have any significant influence on flows and levels. This facility is not operated. There are no level or flow constraints.

9.3.5 Victoria Lake Dam - Private

This facility no longer exists. The remnants of this facility are not expected to have any significant influence on flows and levels. This facility is not operated. There are no level or flow constraints.

9.3.6 Aylen Lake - MNR Bancroft

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Aylen Lake is usually maintained between 6.9 and 8.1 feet LD. The annual variation of the operating band is shown in Figure 9.12.

The typical annual mode of operation of Aylen Lake Dam is summarized in Table 9.22

Table 9.22: Aylen Lake Operating Regime

Season	Operation
Spring - Fall	From the May to September 15, 10 logs are in the dam to maintain the desired level of 7.9 feet. Two logs are removed in early September to begin the drawdown to 7.0 feet for the lake trout.

9.4 YORK RIVER TRIBUTARY

9.4.1 Sandox Lake - MNR Bancroft

This facility no longer exists. The remnants of this facility are incorporated into a beaver dam. This facility is not operated. There are no level or flow constraints.

9.4.2 Mink Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

9.4.3 Diamond Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

Diamond Lake Dam is not operated and has been submerged for over 20 years. The level of the lake is controlled by a municipal culvert.

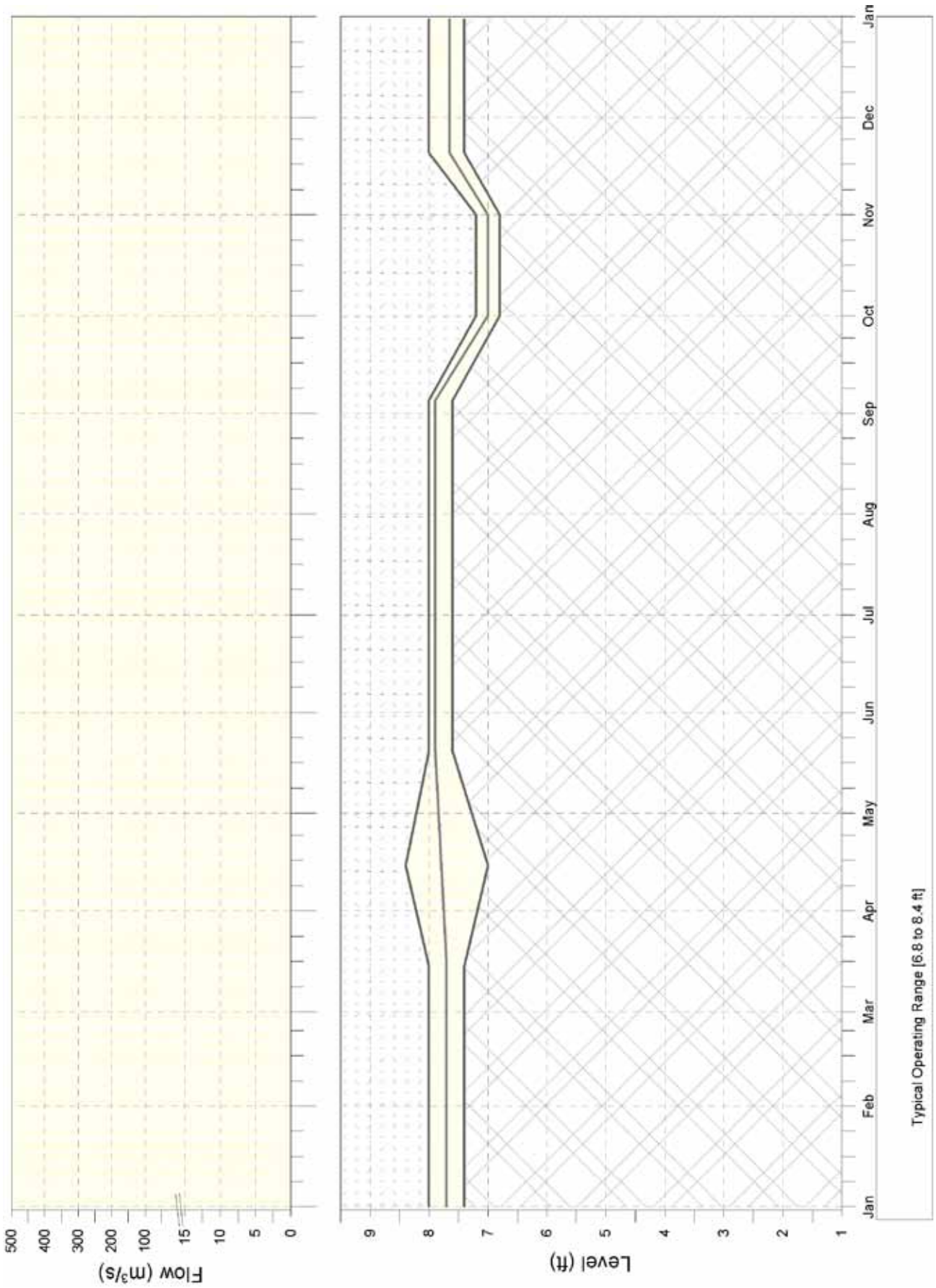


Figure 9.12: Aylen Lake Operating Band

9.4.4 Baptiste Lake - MNR Bancroft

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Baptiste Lake is usually maintained between 6.5 and 8.8 feet LD. The annual variation of the operating band is shown in Figure 9.13.

The normal operating zone, which includes the ideal water level, is the range in which most interests should be satisfied during the year and is shown in yellow on Figure 9.13. The range has been developed through an analysis of average water levels satisfactory to user groups and gauge readings experienced over the last fourteen years of operation.

The operating zone represents mid-range water levels both above and below the normal operating zone in which inconvenience and minor damage can occur. Usually water levels in these ranges are of short duration, except during prolonged wet or dry periods.

The high water level zone/low water level zone represents extremes of the water level range. These are above and below the operating zone, respectively.

Water levels in the high water level zone usually occur only at the peak of an abnormally high spring run-off or following an extremely large summer rainfall period and are of short duration.

The typical annual mode of operation of Baptiste Lake is summarized in Table 9.23.

Table 9.23: Baptiste Lake Operating Regime

Season	Operation
Spring & Summer	March 15 drawdown (6.50 - 7.00), dependent on snow level, moisture content and general weather forecast. Restrict drawdown for walleye/muskie from April 15 to mid July no less than one foot, then maintain to September 1. May 1 high water level zone: 8.50 feet July 15 summer optimum operating level: 7.80 feet.
Fall & Winter	Fall drawdown for lake trout to 7.30 feet and will remain constant until the end of October. The level will go no lower than 6.50 until March 15. January 1 freeze up at 7.50 feet.

9.4.5 Bancroft Light & Power - Bancroft PUC

Flow and level limits for the Bancroft Light and Power facility is contained in the simplified BLP Water Management Plan.

Copies of the plan can be obtained from BLP. See section 9.1.4 for BLP contact information.

9.4.6 L'Amable Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints. The logs in the sluice are set to maintain a level of 4.55 m during the summer. There are five full logs and one split log in the dam at Lamable at all times of the year.

9.4.7 Salmon Trout Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints. The sluice is set with three and a half small logs.

9.4.8 Gin Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

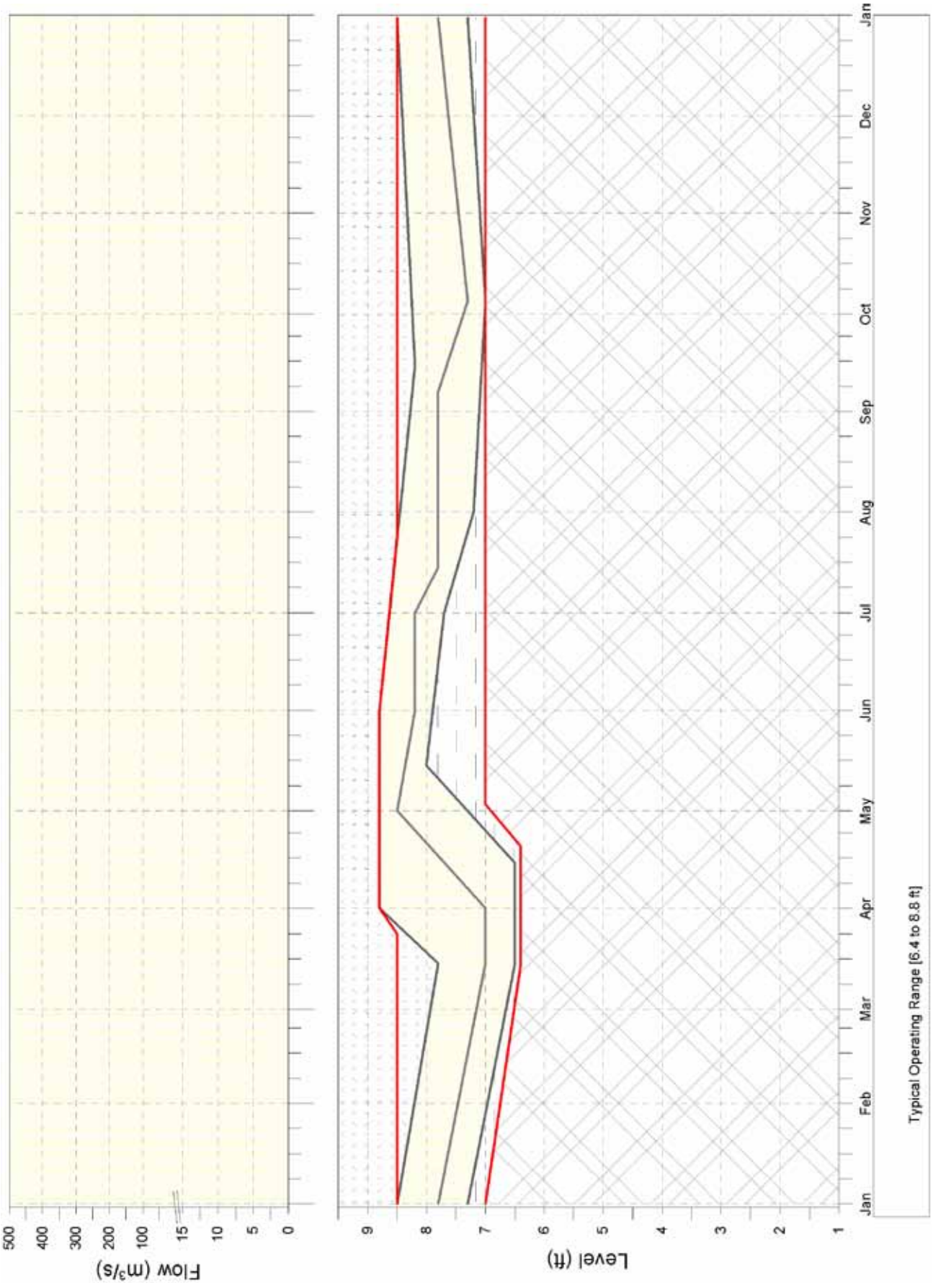


Figure 9.13: Baptiste Lake Operating Band

9.4.9 Weslemkoon Lake - MNR Bancroft

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Weslemkoon Lake is usually maintained between 317.40 and 318.05 m CGD. The annual variation of the operating band is shown in Figure 9.14.

The typical annual mode of operation of Weslemkoon Lake Dam is summarized in Table 9.24.

Table 9.24: Weslemkoon Lake Dam Operating Regime (Weslemkoon Lake Dam Operation Plan (1985))

Season	Operation
Spring	In anticipation of high flows, one to two weeks prior to the freshet the lake level should be drawn down as slowly as possible yet succeed in providing at least an extra 0.3 m of additional storage below the summer minimum level. After spring freshet, the level should be in the upper portion of the summer range unless the watershed is saturated and/or rainfall is expected (lower portion of summer range should be used).Lake level should be maintained in late spring in its upper summer range by having approximately eight stop logs in the dam.
Summer	As the summer begins, eight to nine stop logs will be required to hold the water level in the upper half of the summer range between 317.8 m and 318.05 m.
Fall	The lake should achieve its minimum summer level by the Thanksgiving weekend. By the end of October, a lake level of 317.8 m or lower should be achieved and held constant throughout the winter.
Winter	A log setting of six to seven logs should hold a level of 317.8 m.

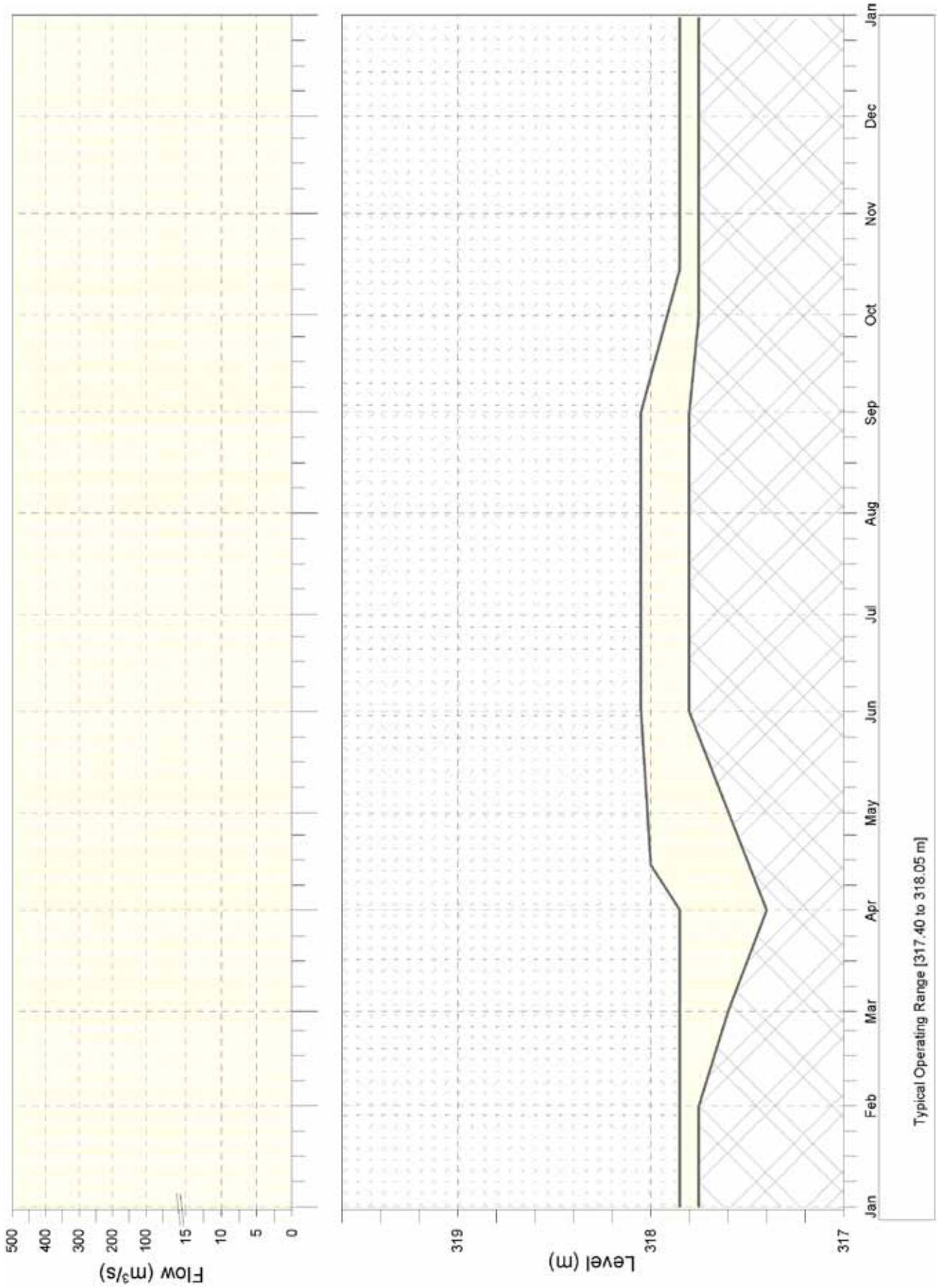


Figure 9.14: Weslemkoon Lake Operating Band

9.5 WABA CREEK TRIBUTARY

9.5.1 White Lake - MNR Pembroke

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of White Lake is usually maintained between 3.5 and 5.2 feet (LD).

A minimum flow (baseflow) requirement for the White Lake Dam has been established. A flow of 0.14 m^3/s will be maintained at the dam at all times to ensure a sufficient flow is discharged into Waba Creek. This will provide a flow for the maintenance of fish habitat and address other ecological concerns during low flow conditions. A notch will be placed between the second and third log of the middle stop log bay.

The annual variation of the operating band is shown in Figure 9.15. Water levels will decrease gradually from the spring flood peak in April to a constant level through the first half of May. In the middle of May the summer drawdown will commence, which will bring the lake down to the winter holding level.

The typical annual mode of operation of White Lake Dam is summarized in Table 9.25.

Table 9.25: White Lake Dam Operating Regime

Season	Operation
Spring	The logs should be left at the winter setting until the water level rises above 3.5 feet on the gauge, at which point the logs should be replaced. By May 1, the water level should attain a target level of 5.2 feet. However, depending on the timing of the spring freshet (to avoid ice damage), all attempts should be adjusted made to attain the 5.2 feet level by April 15 to facilitate pike spawning. Stop logs should be manipulated through the remainder of the spring period so that water levels follow those prescribed by the operation plan. The drawdown is to begin May 15.
Summer	The target level for July 1 is a gauge reading of 4.9 feet, and the dam should be operated to reach this level. During the period from May 1 to September 1 water levels should be dropped gradually to reach 4.3 feet.
Fall & Winter	The fall/winter holding level is 3.5 feet which should be reached by October 15. If this level is not achieved by November 1, then that recorded level on this date will be considered the fall/winter holding level. Levels throughout the fall and winter should be maintained within +/- 0.3 feet of the holding level. If the level should drop below 3.5 feet, it will be as a result of natural variation.

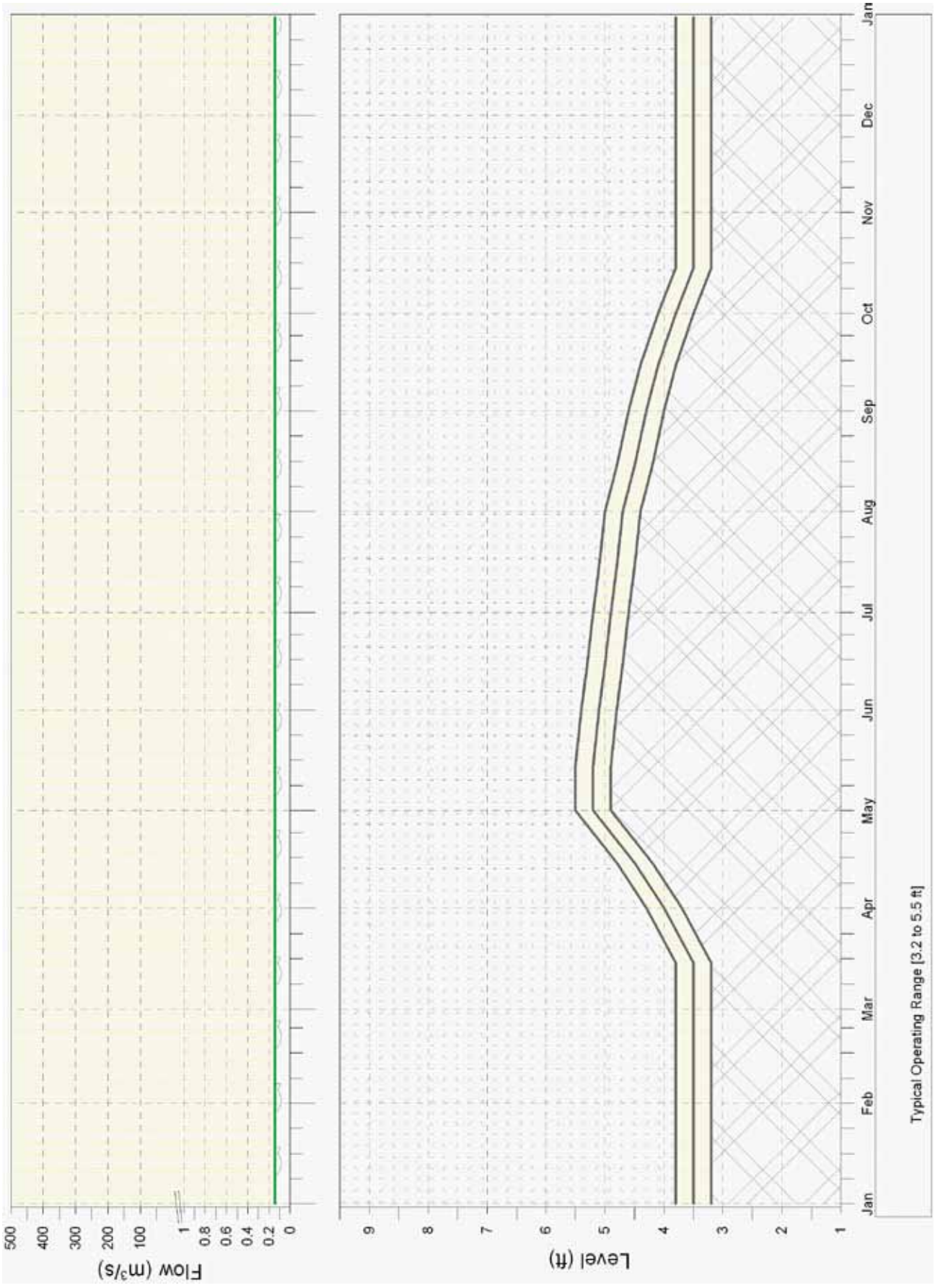


Figure 9.15: White Lake Operating Band

9.5.2 Fraser GS

The compliance framework for facilities on Waba Creek consists of a flow limit. The flow limit has been established as a result of the minimum flow requirement of 0.14 m^3/s for the White Lake Dam. Flow limits for the Fraser GS are outlined in Table 9.26.

Table 9.26: Fraser GS Mandatory Flow Limits

Parameter	Value	Limit Type, Conditions and Notes
Minimum Flow	0.14 m^3/s	Type: Mandatory Minimum Flow Minimum flow will be achieved via leakage through the dam. Operator must visually inspect to ensure that water is always being passed through the dam to the creek.

The typical annual mode of operation of Fraser GS is summarized in Table 9.27.

Table 9.27: Fraser GS Operating Regime

Season	Operation
Spring	Flash boards are pulled on the Fraser Dam during the spring thaw on White Lake to accommodate the freshet. The water levels remain high until approximately the end of April and the turbine usually runs at full capacity during this time.
Summer	As the water level drops due to the log manipulation at the White Lake Dam, the flashboards are put back in place to maintain the headpond at a higher level.The turbine is adjusted according to the water flow and dam is not operational for two tp three months during the summer as the flow in the creek is diminished. During this period, water continues to spill over the dam and leakage through the dam to the creek bed is continuous.
Fall	Fall precipitation typically increases the level in White Lake, allowing for a greater flow in the creek. The turbine runs accordingly to the flow.
Winter	The turbine runs throughout the winter, but, not at full capacity.

9.5.3 Stewart Mill at Waba (Sawmill Dam)

This facility is not operated. There are no level or flow constraints.

9.5.4 Stewart GS

The compliance framework for facilities on Waba Creek consists of a mandatory flow limit. The flow limit has been established as a result of the minimum flow requirement of 0.14 m^3/s for the White Lake Dam. Flow limits for the Stewart GS are outlined in Table 9.28.

Table 9.28: Stewart GS Mandatory Flow Limits

Parameter	Value	Limit Type, Conditions and Notes
Minimum Flow	0.07 m^3/s	Type: Mandatory Minimum Flow A notch will be incorporated into the design of the new dam to provide for the minimum flow during low flow conditions. The notch will need to be inspected regularly to ensure the minimum flow is being passed: - Original creek bed - 0.07 m^3/s - Diversion channel - 0.07 m^3/s

The typical annual mode of operation of Stewart GS is summarized in Table 9.29.

Table 9.29: Stewart GS Operating Regime

Season	Operation
Spring	Stop logs are pulled from the dam as required to accommodate for the spring freshet.
Summer	Logs are replaced and the operating level is maintained. A minimum flow is maintained in the creek bed by a notch in the stop logs. Depending on the rainfall, evaporation, and operating regime of the White Lake Dam, the turbine is adjusted to the flow to maintain a maximum head and output. The generator may be shut down for a period of time due to the lack of flow.
Fall & Winter	Operations are relatively the same. The turbine runs according to the flow in the creek.

9.5.5 Barrie GS

The compliance framework for facilities on Waba Creek consists of a mandatory flow limit. The flow limit has been established as a result of the minimum flow requirement of 0.14 m^3/s for the White Lake Dam. Flow limits for the Barrie GS are outlined in Table 9.30.

Table 9.30: Barrie Stewart GS Mandatory Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 0.093 m^3/s	Type: Mandatory Minimum Flow A notch in the dam will provide for minimum flow to the original creek bed during low flow conditions. Notch will need to be inspected regularly to ensure minimum flow is being passed. - Creek Bed - 2/3 of flow (~0.093 m^3/s) - Diversion Channel - 1/3 of flow (~0.047 m^3/s)

The typical annual mode of operation of Barrie GS is summarized in Table 9.31.

Table 9.31: Barrie GS Operating Regime

Season	Operation
Spring	Stop logs are pulled from the weir as required to accommodate for the spring freshet.
Summer	Logs are replaced and the operating level is maintained. A minimum flow is maintained in the creek bed by a spacer in the stop logs. Depending on the rainfall, evaporation, and operating regime of the White Lake Dam, the turbine is adjusted to the flow to maintain a maximum head and output. The generator may be shut down for a period of time due to the lack of flow.
Fall & Winter	Operations are relatively the same. The turbine runs according to the flow in the creek.

9.5.6 Dupuis Dam

This facility is not operated. There are no level or flow constraints.

9.6 OTHER TRIBUTARIES

9.6.1 Sasajewun Lake - MNR Algonquin Park

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The level of Sasajewun Lake is usually maintained between 0.6 and 2.2 m LD. The annual variation of the operating band is shown in Figure 9.16.

The typical annual mode of operation of the Sasajewun Lake Dam is summarized in Table 9.32.

Table 9.32: Sasajewun Lake Dam Operating Regime

Season	Operation
Spring	Logs are replaced following the freshet.
Summer	All five logs are used to maintain a minimum summer level of 1.52 metres on the staff gauge.
Fall	Three to four logs are pulled through the fall.
Winter	One or two logs are left in the dam over the winter and may be pulled at the onset of the spring freshet.

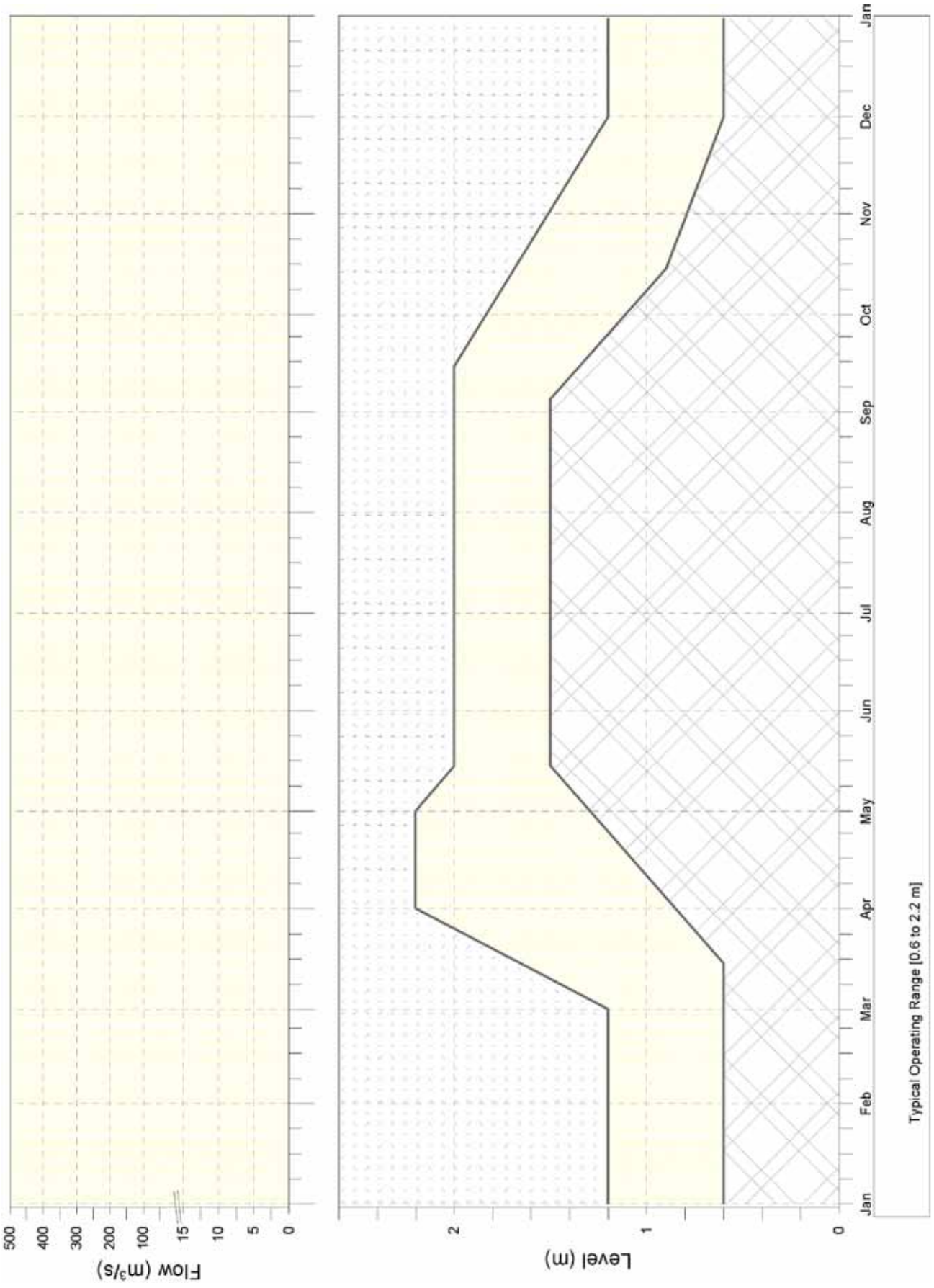


Figure 9.16: Sasajewun Lake Operating Band

9.6.2 Hay Lake - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

9.6.3 Lyell (Cross) Lake Dam - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

9.6.4 Halfway Lake - MNR Pembroke

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The typical annual mode of operation of Halfway Lake Dam is summarized in Table 9.33.

Table 9.33: Halfway Lake Dam Operating Regime

Season	Operation
Spring & Summer	Generally in early April, all logs are pulled in anticipation of the spring freshet. Logs are replaced gradually to maintain a water level at approximately six inches below the top of the dam. Generally, all logs are back in the dam by July.
Fall	Depending on fall water levels, one to two logs may be pulled from the dam to maintain the desired level.

9.6.5 Denbigh - MNR Bancroft

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits. The typical annual mode of operation of Denbigh Lake Dam is summarized in Table 9.34.

Table 9.34: Denbigh Lake Dam Operating Regime

Season	Operation
Spring	Stop logs should be left at the winter setting until the peak of spring freshet has passed. All eight logs should be in place before the end of May.
Summer	The summer normal operating level is 348.42 m. All eight logs should be left in the dam, except in the case of emergency operation, in order to maintain the regulated water level. If downstream flow is desired, the use of spacers between the logs may be instituted, but this has not been the practice in the past.
Fall & Winter	One log should be removed from the dam (7 logs remain) by October 15 in order to initiate the fall drawdown. The removal of the log will lower the reservoir to 348.12 m.

9.6.6 Dwyers Marsh - MNR Bancroft

This facility is not operated. There are no level or flow constraints.

9.6.7 Balaclava Dam (Constant Lake) - MNR Pembroke

The compliance framework for MNR facilities in the Madawaska River watershed does not require the use of mandatory level or flow limits.

The dam is used to maintain the levels of Constant Lake for recreational purposes and provides some flood reduction when the lake is lowered prior to the spring freset. The current maximum that the water level is to be maintained on Constant Lake is 61.82 m LD, as defined on the water gauge that was installed on the buttress of the Balaclava Dam. The MNR allows the water level to exceed the 61.82 m level by approximately six to eight inches (15.2 cm to 20.3 cm) to provide optimum levels prior to the lake experiencing water level decrease due to summer evaporation, minimal inflows and anticipated lack of rain. It has been noted in the past that some landowners on the lake may experience flooding if the level exceeds the allowable six to eight inches (15.2 cm to 20.3 cm). Water levels of downstream Constant Creek and the lakes on the system must also be taken into consideration as recreation values, habitat, and flows must be maintained accordingly.

The typical annual mode of operation of Balaclava Dam is summarized in Table 9.35.

Table 9.35: Balaclava Dam Operating Regime

Season	Operation
Spring	The lake level is closely monitored immediately after ice-out to determine the capacity available to accommodate inflows resulting from the spring freshet. Stop logs may be removed according to the conditions at the time. Once the freshet is over and after the fish have spawned, eggs of the year have hatched, and the fry have moved into deeper water (upstream and downstream), stop logs are replaced to capture and hold a level approximately six inches above the maximum level of 61.82 m.
Summer	All the stop logs are placed in the dam for the summer months and generally there is no further manipulation unless there is a major rain event resulting in unacceptably high water. In that instance, stop logs may be removed until such a time that the lake level recedes to its normal summer level. A six-inch buffer will be attempted in circumstance as well.
Fall	Drawdown of the lake generally begins in the later part of October. This drawdown is to provide room in the lake basin for the spring freshet.
Winter	Once drawdown and freeze-up have occurred, stop logs are generally not manipulated again until the following spring.

The Balaclava dam currently provides a base flow to Constant Creek through dam leakage. As noted in section 4.5.6, the Balaclava Dam will be replaced with a new structure over the next few years. Similar to the White Lake Dam, a continuous minimum flow (base flow) will be established for the new structure and passed at all times through a low flow diversion valve. This will be established based on the amount of water that is currently being passed as leakage through the dam. Once the dam is constructed, the base flow passed through the valve will safeguard fish and riparian waterfowl, including their downstream habitats, at key times during their lifecycle. The new dam will be operated to the current operating regime, as noted above, with some minor fine-tuning if necessary.

9.6.8 Mackie Creek Weir - OPG

This facility is not operated. There are no level or flow constraints.

10 EFFECTIVENESS MONITORING

Effectiveness monitoring is a required component of water management planning and is a new component to the 2009 WMP. Effectiveness monitoring is used to determine if management activities are producing the expected or desired result. Within a WMP, effectiveness monitoring may provide evidence to determine if changes prescribed by the WMP have been successful in achieving the desired effects or the objectives.

Water management planning is an adaptive management process. Through effectiveness monitoring during the term of the plan, information gathered will be used to make improved resource management decisions, reduce the amount of uncertainty and make adjustments for the next planning cycle.

The Madawaska River WMP 2000 did not contain an Effectiveness Monitoring Plan; however, it did define a commitment to sustainable development as being "a water management regime that results in a balance among a range of natural heritage, social and economic values for the benefit of present and future generations." It was anticipated that this balance could be achieved through the maintenance of six well-defined goals:

1. sustaining and enhancing the river's aquatic ecosystem and biological diversity
2. generating electricity safely, efficiently, reliably and economically (at competitive prices) while making a reasonable effort to ensure that the economic well being of other stakeholders is considered
3. supporting a range of recreational and tourism uses
4. fostering greater public awareness and understanding of the river as an interconnected system
5. being cooperative and maintaining improved levels of communication
6. working in partnership with individuals and groups

The Effectiveness Monitoring Plan developed for the WMP 2009 takes into consideration the effectiveness of the 2000 plan in achieving the goals listed above. Additionally, the working group for the WMP 2009 and the SAC are in agreement that the goals set forth in the WMP 2000 are still viable and that they be carried forward. Table 10.1 tabulates accomplishments in relation to the above-noted goals and proposes on-going monitoring and programs where needed.

Table 10.1: Effectiveness Monitoring Plan

Objectives	Sub- Objectives	Strategic Approach	Who	Monitoring / Reporting
Sustain and enhance the river's ecosystem and biological diversity	Maintain spring spawning opportunities for walleye. Where possible, minimize water level fluctuations as they affect aquatic and riparian wildlife. Protect, restore, and enhance aquatic ecosystems. Protect, maintain or enhance waterfowl habitat. Protect, maintain, or enhance wildlife habitat.	1. Continue to monitor flows, water levels, precipitation and dam operations during critical spawning periods. 2. Information Needs Table has been updated since 2000 to reflect completed, ongoing and incomplete Information Needs. 3. Be responsive to any issues raised related to the impact of the WMP of the Madawaska River System.	OPG & MNR	1. Key gaps information needs will be updated during plan implementation. 2. a) SAC to assist MNR and OPG to prioritize Information Needs b) Annual report produced that would capture any work or studies affecting the ecological integrity of the river. 3. SAC continues to bring forward potential issues on an on-going basis.
Generate electricity safely, efficiently, reliably, and economically	Maintain or enhance power generation on the system. Balance the electrical generation targets of the province, while balancing the competing uses of the system.	1. Continue to monitor flows, water levels, precipitation and dam operations. 2. Need to summarize operational requirements on an annual basis.	OPG & Waba Creek Producers	1. Records will be kept on file. 2. Annual report to be produced by the power producers, with SAC involvement.

Table 10.1: Effectiveness Monitoring Plan Continued

Objectives	Sub- Objectives	Strategic Approach	Who	Monitoring / Reporting
Support a range of recreational and tourist uses	Maintain water levels for safe navigation throughout the recreational season and entire system. Be responsive to requests from recreational groups (non-commercial & commercial) for activities on the water. Improve the use of recreational areas such as marinas, parks, boat launches, boardwalks and trailer parks.	1. Maintain and foster new relationships with recreational groups. 2. Construct a new visitor's survey for the Madawaska River.	OPG, MNR & Waba Creek Producers	1. SAC continues to bring forward issues on an on-going basis. 2. A new survey will be conducted during the implementation of the 2009 plan.
Foster greater public awareness and understanding of the river as a system	Explain constraints and natural processes that are considered in the operation of the Madawaska River system. Foster an understanding of how the system operates.	1. Make a comparison of the issues raised by the public during the next public planning cycle against those from the original planning process and the current planning process.	MNR, Proponents & SAC	1. Comparison to be Included in the next planning cycle (WMP 2019).
Maintain improved levels of communication	Reduce the number of public issues received by MNR, OPG, and the SAC	1. SAC was established in August 2000. It will assist in WMP 2009 plan implementation. 2. Annual Stakeholder meetings will continue. 3. OPG website contains water level information, a link to the WMP 2009 and SAC activities. 4. OPG has developed a water levels information phone line.	MNR & OPG OPG OPG OPG	1. SAC Meetings will continue to document record of public issues to date OPG and MNR will provide a written report summarizing issues/concerns. 2. Records of issues, information requests will be documented by OPG. 3. Website to be updated on a regular basis. 4. Phone calls are returned and concerns documented and reported.
Work in partnership with individuals or groups	Continue to develop and foster partnerships with recreational groups to assist with the implementation of the WMP.	1. Walleye Watch will continue with the Arnprior Fish & Game Club , Calabogie F&G Club and other groups. 2. White-water releases for Madawaska Kanu Centre when flows are available will be maintained.	OPG, MNR & Partners	1. Reports to MNR from the partners for the annual spawn – information relayed to OPG for flow manipulation. 2.Communication between OPG and MKC to be maintained for potential releases.

11 GLOSSARY OF TERMS

Absolute Maximum: A mandatory maximum level that the facility can be raised to for operational purposes. More restrictive operations apply under specified conditions. The level may be increased above the specified value under specified conditions, with MNR consent, due to high flow conditions or facility contingencies.

Absolute Minimum: A mandatory minimum level that the facility can be reduced to for operational purposes. More restrictive operations apply under specified conditions. The level may be reduced below the specified value for specific maintenance activities or during facility contingencies. MNR and DFO consent may be required for specific maintenance activities or during facility contingencies.

Base Load: The minimum of continuous amount of power required over a long period of time. Baseload facilities are used to produce energy at a constant rate, at all times through the year to meet some or all of a given region's baseload energy demand.

Baseflow: That portion of streamflow derived from groundwater storage to surface streams.

Buttress: A horizontal step or bench in the upstream or downstream face of an embankment dam.

Calm level: the water level measured in a stilling well or by averaging to remove short-term water fluctuations caused by waves and surges that can be generated by the wind, boats, high water velocities and other sources.

Cascade: A series of waterfalls or a series of steps in which the water travels over. At each of the facilities, the water level upstream of the facility is fairly flat and then falls vertically at the dam into the next facility. The level downstream of each facility is essentially the same as the upstream level of the next facility in the cascade. Another way to look at this is as a set of stairs with the water flowing over each stair. Hydroelectric facilities would be located at vertical portions of each stair.

Cavitation: When the pressure of water falls below its vapour pressure, the water boils and forms vapour bubbles. The vapour bubbles are carried along with the water and until they collapse in an area of high pressure. Over time, significant damage can occur when the collapse of the bubbles occurs near or in contact with a solid surface.

Chain/Wire Gauge: A chain/wire gauge consists of a chain or wire with a weight attached to the end that is lowered into the water and a horizontally-mounted staff gauge which is mounted to a fixed object. The weight is lowered on the wire/chain until it contacts the water surface. The water level reading is taken from a distinct mark/location on the wire/chain held against the staff gauge. A chain gauge zero is usually added to the reading of the water surface on the staff gauge to obtain a CGD elevation or level.

Channel Length: A long, deep portion of a river or other waterway through which water and sediment flow.

Conditional limit: A limit that is applied once the prescribed conditions are met.

Crest: The elevation of the uppermost surface of a dam excluding any parapet wall, railings, etc. The crest of a dam refers to the crown of an overflow section of a dam.

Dam: A structure built as a barrier to the flow of a stream or river.

Declared floods: A flood emergency is declared by a local municipality.

Decommissioned: A dam that is no longer operating to impound or divert the flow of water.

Discharge: The volume of water through a passage of any given section during a unit of time.

Diversion canal: A constructed open channel for transporting water.

Drainage Area: An area that drains naturally to a particular point on a stream.

Drawdown: The lowering of the water level from a reservoir for power generation, flood control, or other water management activities; usually associated with a dam or facility that has an annual cycle in which the level is lowered through a portion of the winter to make storage room for high flows that typically occur in the spring. The lowering of the water level associated with daily water fluctuations are usually not considered a drawdown nor is the daily lowering of the level and refill over the course of a week.

Dry Gas Purge System: A pressurized constant flow of gas is fed through an outlet port at a fixed point below the water surface. The pressure at the outlet port builds up to the same pressure as the water at that depth. Gas flows from the tank through a restriction to the outlet port. The pressure across the restriction is measured by a pressure transducer or manometer.

Earth embankments: Artificial hill or ridge constructed of fill material, usually earth or rock, placed with sloping sides and usually with a length greater than its height.

Electric Tape Gauges (ETG): A measuring tape on a reel which is mounted to a fixed object. Each reading requires an individual to lower the tape into the water. The elevation of the measuring point on the ETG housing is at a known elevation. The tape has a metal weight attached to the end that is lowered into the water and is also connected to a battery and a volt meter. The measuring tape is slowly lowered by turning the reel until the metal touches the water. A small voltage is indicated once the metal weight makes contact with the water surface and closes the electrical circuit.

Electrical capacity: The maximum load of electric power, commonly expressed in megawatts (MW), by which generators, turbines, transformers, transmission circuits, stations, or systems are rated.

Emergency Operating State: The IESO is responsible for declaring an emergency operating state. An emergency operating state would usually be declared when non-dispatchable load would have to be shed to respect normal operating state security limits.

Fall Walleye Index Netting: Survey to assess the relative abundance of a fish stock and provide other biological measures or indicators of the target population's status. The fall walleye index netting, or FWIN, method uses overnight sets of multi-mesh gillnets and is therefore a method to be used in waterbodies where lethal sampling is acceptable.

Flashboards: A length of timber, concrete, or steel placed on the crest of a spillway to raise the retention water level, but which may be removed in the event of a flood by manual retrieval, a tripping device or by deliberately designed failure of the flashboard or its supports.

Float Gauge: Consists of a weight attached to one end of a tape or wire with a float on the other end. The tape runs over a pulley which rotates as the water surface level changes. The pulley system is mounted to a fixed object. The elevation of the measuring point on the pulley system housing is at a known elevation.

Flood Maximum: A conditional level limit to provide water storage capabilities to reduce peak flows during periods of significant flooding.

Flood Threshold: A flow which is know to cause nuisance flooding of docks and other structures in low lying areas. This threshold is not associated with a certain return period or land use planning requirements.

Flow: The rate of water discharged from a source, given in volume with respect to time.

Freshet: A large increase in stream flow due to heavy rains or snowmelt.

Gate Sluice: A movable water barrier that slides in supporting guides and permits passage of water over or through a dam. The amount of water passing through the sluice is adjusted by sliding the gate up or down.

Generating Capacity: The maximum power that a power plant, such as a hydroelectric dam, can produce under specific conditions.

Head: The difference between the headwater level and the tailwater level at a generating station.

Headwater: The water immediately upstream from a dam. The water surface level varies due to fluctuations in inflow and the amount of water passed through the dam.

Headpond: A body of water confined by a dam and used to collect and store water.

Headwaters: Streams flowing from the sources of a river; usually associated with upland areas.

Hydroelectric Generating Station: A power plant that converts the energy of falling water into electricity.

Hydrology: One of the earth sciences that encompasses the natural occurrence, distribution, movement, and properties of the waters of the earth and their environmental relationships.

Inflow: Water that flows into a reservoir or forebay during a specified period.

Instantaneous flow: Flow at a particular moment of time. The term instantaneous flow is used to differentiate between minimum daily average flow requirements and flow requirements that must be above a threshold for a specified period. A daily average flow could be achieved at a facility by a sequence of flows that vary through the day and go below the threshold for portions of the day. An instantaneous flow limit must be above the threshold as per the conditions set out in section 9.1.1.2.

Lakes and Rivers Improvement Act: A piece of legislation in Ontario that provides for the use of waters of lakes and river in Ontario; regulates improvements, development or construction in these; preserves public rights over such waters; protects the interests of the riparian owners; aims to legislate the use and management of fish and other natural resources dependent of the waters, and to preserve the natural amenities of Ontario's waterways, and associated shores and banks.

Leakage: Uncontrolled loss of water by flow through a hole or crack in the dam.

Level: Height or elevation of the water above sea level.

Log Sluice: A movable water barrier consisting of logs placed horizontally across the opening to control the passage of water over or through a dam. The amount of water passing through a log sluice is adjusted by taking logs out or putting them in to allow more or less water to flow over the top of the logs and through the sluice.

Maximum Summer Flow: A conditional flow limit to reduce water velocities in the river to benefit recreational users downstream of the facility.

Minimum Aquatic Ecosystem Flow: A minimum flow to ensure a reasonable amount of protection for the aquatic ecosystem. The minimum flow may apply to the entire facility or a specified portion of a facility. The flow may be reduced below the specified value with MNR and DFO consent for specific maintenance activities or during facility contingencies.

Minimum Dilution Flow: A conditional flow limit is to provide an adequate quantity of water over a specified period to flush out sewage treatment effluent.

Minimum Walleye Incubation Flow: A conditional limit to provide a reasonable flow during the walleye incubation period at specific spawning locations at a facility. The minimum flow may apply to the entire facility or a specified portion of a facility.

Minimum Walleye Spawn Flow: A conditional limit to provide a reasonable flow to attract walleye to specific spawning locations at a facility. The minimum flow may apply to the entire facility or a specified portion of a facility.

Muskrat Range: A conditional level range to restrict the winter drawdown and reduce the potential of an ice cap blocking the entrances to the muskrat lodges.

Natural Flow Regimes: The variation of flows and level in a river system without the impact of dam operations and other significant human-induced changes.

Normal Minimum: A conditional level limit is to provide emergency energy to the Ontario Electrical System during an energy emergency. This limit restricts the use of the water in storage from the specified value down to the absolute minimum for use in an Energy Emergency.

Off-peak: Period of relatively low demand for electrical energy.

Ontario Low Water Response: A program intended to ensure provincial preparedness, to assist in co-ordination and to support local response in the event of a drought. This plan is based on existing legislation and regulations and builds on existing relationships between the province and local government bodies.

Operating band: The range in water level that a lake is usually kept within; the band may change over the course of the year to accommodate various uses and concerns.

Overflow weirs: A spillway that is used to discharge water at a dam.

Peaking: Generating capability normally designed for use only during the maximum load period of a designated time interval.

Penstock: The pipe leading from the water intake to the hydraulic turbine.

Pike Minimum: A conditional level limit to prevent the dewatering and stranding of pike in suitable spawning habitat.

Pressure transducers: A device which is submerged in the water and used to measure the pressure of water. The amount of water pressure is then converted into a depth of water.

Published data: Data that has been subject to a process of validation to ensure reasonable quality data and is used as the official record.

Rapids: A part of a river where the current runs very swiftly.

Reach: Any length of river under study, with definable features.

Recruitment: The number of fish surviving to a defined size or age.

Regulated river system: A river system where the operation of a dam(s) has a significant impact on the flows and level over a large portion of the river.

Reservoir: Lake, sometimes artificial, where water is collected and kept in quantity for later use.

Riffles: A stretch of choppy water caused by a rocky shoal or sandbar lying just below the surface of a waterway.

Rip rap: A layer of large un-coursed stones, broken rock, or precast blocks placed in random fashion on the upstream slope of an embankment dam, on a reservoir shore, or on the sides of a channel as protection against wave and ice action.

Riverine Index Netting (RIN): Assessment survey that utilizes standard FWIN netting techniques and is intended to assess large bodied fishes in slow-moving portions of rivers.

Rule Curve: Describes the annual pattern of operation to meet various requirements through the year and provides the expected level or typical operating band at a given point in the year. Traditionally, a rule curve describes the minimum storage level on an annual pattern to ensure that discharge requirements can always be met.

Run of the river: Hydroelectric generating plants that operate based only on available inflow and a limited amount of short-term storage (daily/weekly pondage).

Sill: The horizontal member that forms the base of a sluice.

Spillway: A structure which permits passage of water over or through a dam. A spillway at a hydroelectric facility does not convey water to the turbines.

Spring Redraw: A conditional level limit to reduce the potential stress on the aquatic ecosystem during a critical period of reproduction. This limit prevents the removal of water from seasonal storage (reduction in the water level) for energy production. A redraw may occur under certain specified conditions.

Staff Gauge: A graduated scale mounted to a fixed object. Staff gauges are large metal rulers or scales which are usually vertically mounted to a fixed object. Each gauge height reading requires an individual to manually observe the location of the water surface on the staff gauge. Sometimes a fixed value or gauge zero is added to the reading of the water surface on the staff gauge to obtain a CGD elevation or level.

Static level: The water level measured in a stilling well or by averaging to remove short term water fluctuations caused by waves and surges that can be generated by the wind, boats, high water velocities and other sources.

Stepped weir: A dam in a river to raise the water level and allow water to flow overtop and where the height of the dam along its length changes at least once so that water at a lower flow will flow over a smaller portion of the dam.

Storage: The volume of water in a reservoir at a given time.

Summer Maximum: A conditional level limit to provide a reasonable water level to benefit recreational users of the water impounded by the facility. The level may be increased above the specified summer maximum when certain conditions of another limit type are fulfilled.

Summer Minimum: A conditional level limit to provide a reasonable water level to benefit recreational users of the water impounded by the facility. The level may be reduced below the specified summer minimum when certain conditions of another limit type are fulfilled.

Summer period: The recreational summer period starts on Saturday 00:00 Eastern Standard Time of the Victoria Day weekend and ends on the Monday at 24:00 Eastern Standard Time of the Thanksgiving Weekend. The Summer period is period in which OPG has adjusted operation on the reservoirs of the Madawaska River to provide for greater recreational opportunities.

Summer Profundal Index Netting (SPIN): A standardized netting technique which specifically targets lake trout in the summer. The technique is non-lethal and involves the use of gill nets.

Tailrace: A channel carrying water away from a dam.

Tailwater: The water immediately downstream from a dam. The water surface level varies due to fluctuations in the outflow from the structures of a dam and may also change because of downstream influences of other dams or structures.

Timber crib dam: A gravity dam built up of crossed timbers, filled with earth or rock.

Total inflow: The volume of water into a body of water over a period of time. The total inflow is a calculated quantity of water.

Tributary: A stream that flows to a larger stream or other body of water.

Turbine Capacity: The maximum amount of water that can go through a turbine at a generating station.

Turbine: A machine for generating rotary mechanical power from the energy of a stream of fuel (such as wind, water, natural gas or steam), converting the kinetic energy of the fuel to mechanical energy; rotary turbines drive generators to produce electricity.

Voltage Reduction: A voltage reduction is implemented by the IESO as an emergency control action to manage grid reliability when there is not enough electricity available to meet demand. This action is among the final steps taken before having to implement rotating blackouts.

Walleye Maximum: A conditional limit to reduce the potential of dewatering eggs as flows naturally drop off.

Walleye Minimum: A conditional limit to prevent the dewatering of walleye spawning grounds.

Water level gauge: An instrument indicating the level of water in a reservoir or stream.

Watershed: The area within which all water drains to collect in a common channel or lake.

Weir: A dam in a river to raise the water level and allow water to flow overtop.

White-water Minimum Flow: a note of interest is to provide releases of water that benefit white-water communities. These notes of interest are neither a mandatory or conditional requirement. The implementation of the flow releases follows the documented guidelines contained with the note.

Winch: A stationary motor-driven or hand-powered machine used for hoisting or hauling, having a drum around which is wound with a rope or chain attached to the load being moved.

Wing wall: A smaller wall attached or next to a larger wall or structure.

12 LIST OF ACRONYMS

BLP	Bancroft Light and Power
CFWIP	Community Fisheries and Wildlife Involvement Program
CGD	Canadian Geodetic Datum
DFO	Department of Fisheries and Oceans
EBR	Environmental Bill of Rights
EST	Eastern Standard Time
ETG	Electric Tape Gauge
FWIN	Fall Walleye Index Netting
GS	Generating Station
ha	hectares
HW	Headwater
IESO	Independent Electricity System Operator
LD	Local Datum
LRIA	Lakes and Rivers Improvement Act
MKC	Madawaska Kanu Centre
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
OPG	Ontario Power Generation
PAC	Public Advisory Committee
PSW	Provincially Significant Wetland
PT	Pressure transducer
PUC	Public Utility Corporation
SAC	Standing Advisory Committee
SEV	Statement of Environmental Values
TW	Tailwater
WMP	Water Management Plan
WMPG	Water Management Planning Guidelines for Waterpower (2002)
WPCC	Water Pollution Control Centre

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APPENDIX A TERMS OF REFERENCE

Madawaska River Water Management Review

Terms of Reference for:

I. The Five Year Report

II. Updated Madawaska River Water Management Plan

January 2005

TABLE OF CONTENTS

1.0 Background / Introduction

The Madawaska River is located in south-eastern Ontario and flows 225 kilometres from its headwaters in Algonquin Provincial Park to the Ottawa River at Arnprior. Its drainage area covers over 8500 square kilometres. The river supports a range of uses, from generating electricity and flood control to a significant amount of recreational and tourism activities.

The Ministry of Natural Resources (MNR) has operational responsibilities for several dams, primarily in the upper reaches of the watershed and manages them to maintain and protect recreational and natural features. Ontario Power Generation (OPG) operates several dams and hydroelectric facilities on the river, is a major user of the water resource on the river, and has a significant economic stake in its operations (see Figure 1). OPG's activities are governed by Licences of Occupation and Water Power Lease Agreements administered by the Ministry of Natural Resources. The public at large and stakeholder groups are also important users and have roles to play in reviewing and managing the river's operations.

In June 1995, as a result of concerns expressed both locally to the Chairman of Ontario Hydro and the Minister of Natural Resources, an agreement was reached between MNR and OPG to form a partnership to conduct a review of water management of the Madawaska River. One of the basic premises of this partnership was to identify the problems and issues associated with levels and flows and to develop solutions to them.

The review was a significant step for several reasons:

1. It aimed to apply several developing concepts of interest to both organizations: sustainable development, water management planning, and an ecosystem approach to management;
2. It involved water planning on the Madawaska River system;
3. It involved public information and participation as a key element of water management planning;
4. It strived to develop management approaches that are cost-effective, building on experiences elsewhere in the province.
5. It would improve communication and cooperation between water management operations of MNR and OPG.

The Madawaska River Water Management Review was finalized in January 2000. The goal of this review was to develop a water management plan to guide levels and flows for the Madawaska River and ensure public awareness of the plan. The plan identifies operation criteria for MNR and OPG-controlled structures and was designed to be a work-in-progress that captured only the current limitations.

Public participation and consultation was instrumental to the Madawaska River Water Management Review. A Public Advisory Committee (PAC) was selected that provided advice and direction to the inter-organization review team. Three phases of Public Consultation, including focus groups and open houses were undertaken. Major concerns regarding the fishery and other ecosystem components were expressed by the public and an "Information Needs" document was developed to identify specific projects. The "Information Needs" document continues to be dynamic in nature and will continue to be updated as projects are completed and new ones are identified. Many accomplishments occurred during the planning process as well as into the implementation process.

In August of 2000, a Standing Advisory Committee (SAC) was formed to monitor the implementation of the water management plan. The mandate of the SAC is to provide a mechanism for the public to contribute to the implementation of the plan, follow the implementation progress, and be aware of issues and proposed changes to the plan. OPG and MNR staff members have continued to be involved with the information needs program and possible amendments to the water management plan. It has been the role of the SAC to bring any new problems and issues to MNR and OPG throughout the implementation of the plan. In May 2002, the SAC produced the First Annual Report for 2001. Similarly, in June 2003, the Second Annual Report (2002) was produced and in November 2004, the third annual report (2003) was issued.

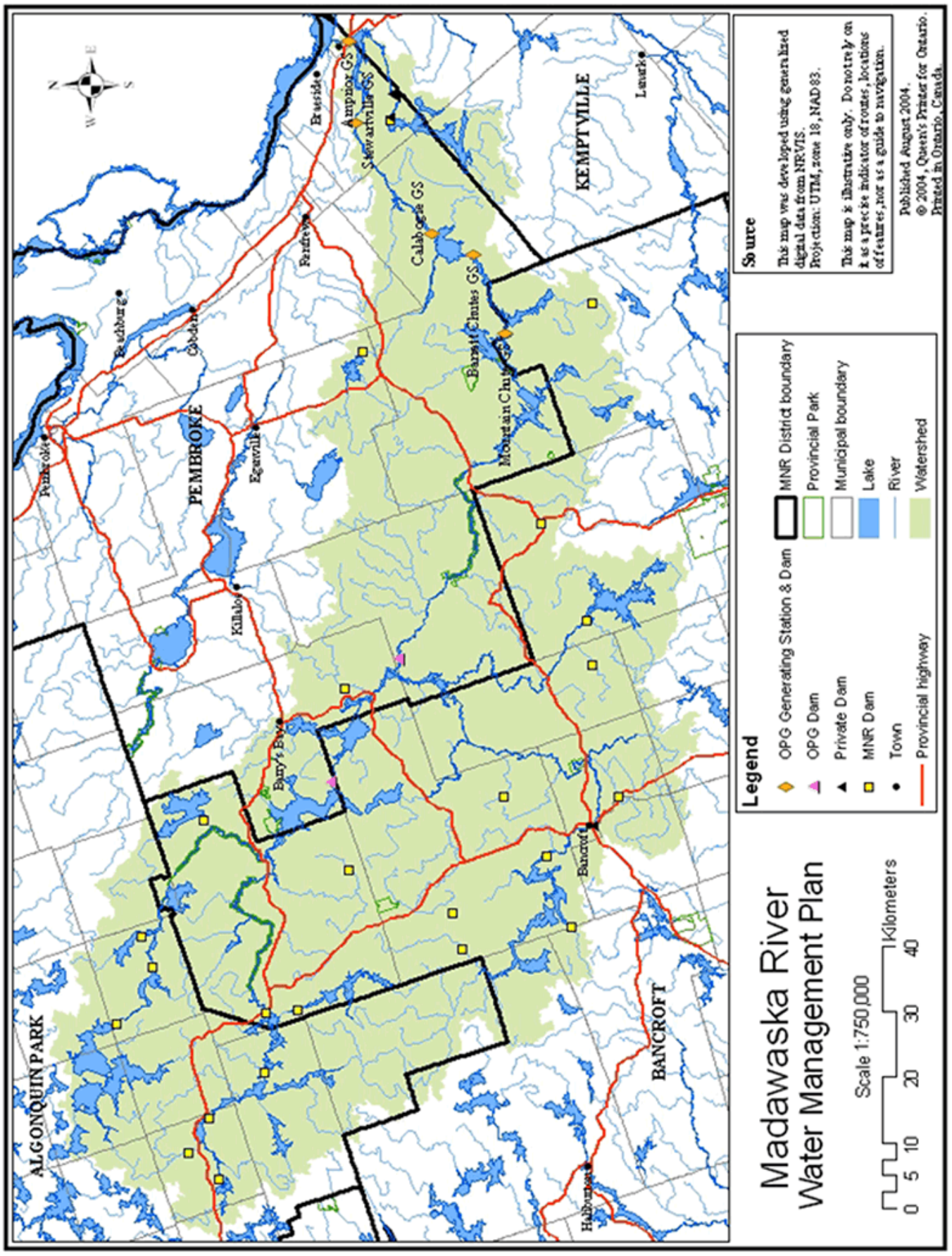

Figure 1: Madawaska River Dams and Generating Stations

The original review document called for a five-year report of the plan's implementation.

The Water Management Planning Guidelines for Waterpower were approved in May 2002. In order to meet the requirements of existing and new legislation and regulations, there are components to the guidelines that need to be incorporated into the Madawaska River Water Management Review document. As a result, the Madawaska River Water Management Review (2000) will be updated to conform wherever possible to the Water Management Planning Guideline for Waterpower (2002).

As a result, two separate reports will be generated. The Five Year Report will be appended to the updated Madawaska River Water Management Plan, which was finalized in December 2005.

2.0 Water Management Planning Goals and Objectives

The goal of water management planning is to ensure the sustainable development of waterpower resources to meet economic, environmental and social objectives for the benefit of present and future operations. This will be achieved through the management of water levels and flows as they are affected by the operations of waterpower generating facilities and associated dams.

A set of general water management planning principles was developed based on the Water Management Planning Guideline for Waterpower (2002). These include:

- Maximum net benefit to society
- Riverine ecosystem sustainability
- Planning based on the best available information
- Thorough assessment of options
- Adaptive management approach
- Timely implementation of study findings
- Respect for Aboriginal and Treaty Rights
- Public Participation

The Ministry of Natural Resources and Ontario Power Generation share a commitment to sustainable development. In the existing Madawaska River Water Management Review, sustainable development is defined as a water management regime that results in a balance among a range of natural heritage, social and economic values and uses for the benefit of present and future generations. It is anticipated that this balance will continue to be achieved through a commitment on the part of the organizations to maintain the following goals:

1. sustaining and enhancing the river's aquatic ecosystem and biological diversity
2. generating electricity safely, efficiently, reliably and economically (at competitive prices) while making a reasonable effort to ensure that the economic well-being of other stakeholders is considered
3. supporting a range of recreational and tourisms uses
4. fostering greater public awareness and understanding of the river as an interconnected system
5. being cooperative and maintaining improved levels of communications
6. working in partnership with individuals and groups

2.1 Five Year Report

The goal of the Five Year Report is to report on the status of the plans implementation by summarizing the items that the Standing Advisory Committee monitored over the last five years and provide recommendations.

The objectives for the Five Year Report are as follows:

1. review the status of the first five years of implementation of the water management plan
2. assess information needs from an ecosystem and resource use perspective
3. communicate final report to the public

2.2 Updated Madawaska River Water Management Plan

The goal for updating the Madawaska River Water Management Review is to update and conform, where possible, the existing inter-agency water management plan to the Water Management Planning Guidelines for Waterpower, 2002, and to communicate it to the public.

The objectives for the update of the Madawaska River Water Management Review are as follows:

1. review of issues over past five years of implementation that may require incorporation in the 2000 plan
2. where possible, the conformity of the plan to the Water Management Planning Guideline for Waterpower (2002),including the incorporation of an Effectiveness Monitoring Plan and a Compliance Monitoring Plan for OPG, MNR and other waterpower producers
3. communicate with the public and provide long-term opportunities for public involvement in the river's management

3.0 Guiding Principles for the Review Process

The following principles will guide preparation of the Five Year Report and updates/conformity of the water management plan.

3.1 Five Year Report

1. Summarize the items that the Standing Advisory Committee (SAC) monitored over the first five years of plan implementation, based on annual reports issued by the SAC
2. Summarize recommendations from the SAC
3. Review of reports and studies undertaken during the implementation
4. Review of outstanding "Information Needs"

3.2 Updated Madawaska River Water Management Plan

1. Current and future operations, as outlined in the existing plan, must adhere to the present licensing and regulatory requirements and build on existing operational practices (under extreme natural conditions it may not be possible to operate within normal limits).
2. For all plan proponents, the identification of issues that need re-assessing, information/studies that need to be incorporated, and identification of gaps in the "Information Needs" document, must be comprehensive.
3. Both an effectiveness monitoring plan and a compliance monitoring plan to be developed and incorporated.
4. The addition of a new reach will be incorporated in the plan in order to include the MNR dam and the three private waterpower facilities on Waba Creek.
5. A simplified plan for Bancroft Light and Power will be appended to the final water management plan.

6. Internal and external communications are integral parts of plan review and will be coordinated between the organizations.
7. MNR and OPG will commit to sharing the costs and applying the necessary resources to the review process and the subsequent implementation and outcome of the updated Madawaska River Water Management Plan.

4.0 Organization for Planning

4.1 Committees

There will be three committees involved in the preparation of the Five Year Report and in the update of the Madawaska River Water Management Review; a Steering Committee, a Working Group, and a Standing Advisory Committee (SAC). The SAC was formed upon the completion of the initial document and have agreed to act in this role in place of forming of a new Public Advisory Committee for the update to the plan. The length of the process may make it necessary for reappointment or replacement of individuals from each participating committee as the process continues. If key individuals leave or are no longer able to assume their role, attempts will be made to replace or reappoint them as soon as possible.

4.1.1 Steering Committee Members (As of January 2005)

Joan Frain	Ontario Power Generation
John Tammadge	Ontario Power Generation
Chris Tonkin	Ontario Power Generation
Ray Bonenberg	Ministry of Natural Resources
Mike Bohm	Ministry of Natural Resources
Ian Crawford	MNR Manager – Water Power Program
Spencer Martin	Department of Fisheries and Oceans Canada
To be determined	Ministry of Environment

4.1.2 Working Group Members (As of January 2005)

Chris Tonkin	Ontario Power Generation
Linda Halliday	Ontario Power Generation
Don Ferko	Ontario Power Generation
Mike Bohm	MNR Pembroke District
Joanna Samson	MNR Pembroke District
Nick Paroschy	MNR Engineer
Jim Niefer	Department of Fisheries and Oceans
Victor Castro	Ministry of Environment

Will draw on other resources as required

4.1.3 Standing Advisory Committee Members (As of January 2005)

Brian Wright

Steve Roy

Ernie Coulas

Damian Hanel

William Morton

J.P. de Grandmont

Marijean Scott

4.2 Roles and Responsibilities

4.2.1 Steering Committee

The Steering Committee will continue to work in an advisory capacity and will meet when necessary to review phases of the plan review. The committee will be responsible for reviewing phases of the work to be completed and ensuring the work is meeting the established goals. The Steering Committee will offer guidance and recommendations throughout the process. In addition, the Steering Committee will continue:

- To consult with the SAC and the Working Group
- To ensure the accessibility, transparency and adequacy of public consultation
- To provide mediation and facilitation of conflict resolution for the Working Group
- To approve plan components and Working Group products prior to submission for approval
- Set deadlines and ensure activities are being carried out
- Provide liaison with political entities

4.2.2 Working Group

The Working Group is responsible for seeing that all tasks are completed to meet the objectives of the Five Year Report and the updates to the plan. The Working Group will deal with action items that will contribute to solutions, and will advise the SAC and support its activities during public consultation.

The Working Group will meet as necessary to complete the two documents and meet the deadlines set by the Steering Committee. MNR and OPG staff will alternate as Chairs for the Working Group. Minutes of all meetings will be taken and a draft version will be circulated to Working Group members and the Steering Committee for review at the next meeting. If the Working Group cannot reach consensus on a particular item, the Steering Committee will be asked to resolve the issue.

Items discussed by the Working Group that have effects outside the Madawaska River, or set precedents for other watersheds, will be directed to the Steering Committee.

4.2.3 Standing Advisory Committee

The SAC will review and provide input into the Five Year Report.

For the update to the water management plan, the SAC, acting in the role of a Public Advisory Committee, will advise the Working Group of any issues and possible solutions that have been raised during the five years of implementation. In addition, the SAC will continually help in planning and implementation of communications and public consultation. As a result, the SAC may be required to meet more frequently during this process than they have during the last five years of plan implementation.

5.0 Planning Process

The following is proposed schedules for the Five Year Report and the Update to the water management plan for the Madawaska River.

5.1 Five Year Report

This schedule targets the completion of the Five Year Report by December 2005:

1. Prepare a Terms of Reference
2. Prepare draft report based on the monitoring of the plan by the Standing Advisory Committee over the first five years of implementation
3. Submitted to SAC for review and comment
4. Final report will be appended to the updated Madawaska River Water Management Plan

5.2 Updated Madawaska River Water Management Plan

This schedule targets completion of the renewed Madawaska River Water Management Plan in 2006.

1. Prepare a Terms of Reference, and a planning schedule
2. Based on the five years of implementation, identify and verify problems, issues, perspectives, possible solutions that may need incorporation into the plan
3. Include components that are required for conformity with the Water Management Planning Guidelines for Waterpower (2002)
4. Completion of draft plan
5. Review draft plan with SAC and public
6. Completion of final plan
7. Provincial and Regional Review of final plan
8. Final public open house
9. Approval of Madawaska River Water Management Plan (2006)

APPENDIX B MADAWASKA RIVER WATER MANAGEMENT PLAN STANDING ADVISORY COMMITTEE TERMS OF REFERENCE

Introduction: Ontario Power Generation (OPG) and the Ministry of Natural Resources (MNR) have cooperated to optimize and balance the water levels and flows of the Madawaska River and its headwaters for the benefit of fish and wildlife resources, power production, recreation and flood control. Since 1997, by means of public consultation and the advice and guidance of a Public Advisory Committee, a new operating plan for the Madawaska River and a document detailing the Problems, Issues and Solutions brought forward by the public have been produced. The Public Advisory Committee (PAC) has recommended that a Standing Advisory Committee (SAC) be established to advise, monitor and assist in the implementation of the Madawaska River Water Management Review plan. The SAC would be composed of a number of citizens representing a diversity of interests along the course of the river, some of whom might be members of the existing PAC. OPG and the MNR have committed to this course of action.

Mandate: The Standing Advisory Committee will provide a mechanism for the public to contribute to the implementation of the water management plan, follow the progress of the plan's implementation and be aware of any issues or proposed changes to the plan. The formation of such a committee will not only enhance OPG's and the MNR's ability to deliver the management responsibilities outlined in the plan, but also provide a communications link with the public to foster and maintain credible relationships. The members of the SAC will be broadly representative of the many and various interests and uses of the river throughout the entire watershed area. The SAC will report to the Madawaska Review Steering Committee, made up of senior management staff from OPG and the MNR. Final decisions on advice received from the SAC shall rest with the Steering Committee members whose organizations are legally responsible for the management of the water resource.

Roles:
The Standing Advisory Committee will perform the following activities:

- Review and advise on matters relating to the implementation of the Madawaska River Water Management Review plan including:
  a) reviewing and recording all issues raised relating to the implementation of the Madawaska River Water Management Plan
  b) advising OPG and the MNR on appropriate solutions to specific water-related issues in the watershed
  c) reviewing all data collected during the monitoring of the plan
  d) advising on all proposed minor amendments to the plan
  e) advising on all proposed major amendments received by OPG and the MNR, and as to whether they should be incorporated in the plan and under what terms of public consultation, or if the application should be considered at the next public review of the plan
- Facilitate the partnership of groups, agencies, organizations, clubs or individuals with OPG and the MNR to assist in implementing the water management plan
- The Standing Advisory Committee will monitor the implementation of the plan and produce an annual status report in January of each year to be distributed to OPG and MNR
- OPG and MNR will each develop a process to log communications from the public regarding water levels and flow issues which will be available for the Standing Advisory Committee to review as part of their roles and responsibilities

- Assist OPG and the MNR in implementing communications and consultation by:
  a) seeking to ensure the participation of all interested parties (the general public, and interest groups) in any consultation process
  b) jointly hosting formal public consultation sessions with OPG and the MNR
  c) reviewing written requests from the public for changes to the plan and advising whether any such requests warrant a public review of the water management plan

Composition: The Standing Advisory Committee shall be composed of no more than nine persons and no fewer than six. Members of the advisory committee shall be selected by OPG and MNR. They will be assisted by one member of the PAC who will selected by the other PAC members. Members selection will be based on:

- The knowledge and perspectives they can provide, rather than representing a specific constituences
- Ensuring a diversity of perspectives or interests are represented, including fishing, recreation, cottagers, boating, tourism, conservation, protection, business, and municipal government
- Ensuring that citizen representation covers the entire watershed and have a knowledge of the entire Madawaska River basin
- Ensuring the majority of the members live/work in the Madawaska River basin geographic area
- Demonstrated ability to work with other groups or organizations to form effective partnerships
- Demonstrated ability to work with others in resolving issues

Members shall be appointed to the committee for a term of three to five years, rotating three at a time.

Administration: The following administrative rules shall apply to the functions of the committee:

- The members shall select a Chair, a Vice-Chair and Secretary, who will serve on an annual basis. Their terms may be extended by the members
- The members may establish an alternate person to represent them in their absence, but each member cannot miss more than one meeting per year
- The members will be reimbursed for reasonable expenses, such as travel and meals
- Meetings will be held at the direction of the Chair, to a minimum of two meetings and a maximum of four per year. Additional meetings may be scheduled with the agreement of all members or as requested by OPG and/or MNR
- The Chair shall be responsible for ensuring adequate notice to members of upcoming meetings, meeting agendas, and the overall conduct of meetings
- In the absence of the Chair, the Vice-Chair shall assume the responsibilities of the Chair
- Co-chairs from OPG and the MNR will be assigned to the committee and will act in an advisory, facilitating and liaison capacity to the committee
- The committee Secretary shall be responsible for preparing meeting agendas and placing items on the agenda at the request of committee members
- OPG and the MNR shall provide secretarial support to the SAC. The secretary shall record the minutes of each meeting, including key discussion points and action items, if any
- The minutes shall be reviewed and approved by the SAC and available for public review
- Recommendations of the SAC shall be arrived at by consensus decision-making. Where consensus is not achieved, majority and minority viewpoints will be noted

- Recommendations of the SAC will be submitted to the OPG and MNR representatives and a decision on the recommendations will be made by the OPG Ottawa-St. Lawrence Plant Group Manager and the MNR Pembroke District Manager. A decision summary will be provided by these to the committee, including written descriptions of where and why they agree or disagree with the recommendations of the SAC
- Meetings shall generally be open to the public, although the committee shall have the right to meet in-camera where matters to be considered need to protect the privacy rights of individual(s)
- Meetings are working sessions; members of the public may observe the sessions and may make scheduled presentations if submitted to the Chair at least 10 days prior to the agenda being set for the next meeting, and SAC members notified
- Other OPG and MNR staff may attend portions of committee meetings in the capacity of advisory or resource persons, and may provide the committee with data and information on matters related to the review through presentations and upon members' request
- OPG and MNR will provide orientation training for the members of the Standing Advisory Committee

Selection Process: SAC members will be selected by OPG and the MNR, with assistance from one member of the former Public Advisory Committee. Through advertisements and letters of invitation, the public will be invited to submit an expression of interest to participate on the SAC. Applicants will be selected based on the criteria outlined in the terms of reference and after completing an interview.

Location of Meetings: SAC meetings will be held in different locations within the Madawaska River valley to allow greater public access to them.

APPENDIX C LIST OF PUBLISHED REPORTS ACTION 7-01

Bland, David. 2002. Waterbirds and other Wildlife in the Madawaska River: A Literature Review, Site Reconnaissance and Preliminary Habitat Assessment (report). Prepared for Ontario Ministry of Natural Resources, Pembroke District Office.

Bland, David. 2003. Reproduction of aquatic birds in Madawaska River wetlands in 2002 (report). Prepared for Ontario Ministry of Natural Resources, Pembroke District Office.

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Speller, Donald. 1999. Proposed design for constructed Walleye Spawning Habitat at Barrett Chute GS. Prepared for Ontario Ministry of Natural Resources, Pembroke District Office.

APPENDIX D RECORD OF PUBLIC CONSULTATION

Public Consultation Documentation Form
Madawaska River Water Management Plan, DRAFT Plan Stage

1. Waterpower producers:	2. Watershed Area:	3. MNR District:
• Ontario Power Generation • Misty Rapids Power • Fraser Power • Barrie Small Hydro	• Madawaska River • Opeongo River Tributary • York River Tributary • Waba Creek Tributary • Other Tributaries	• Pembroke District • Bancroft District • Kemptville District • Algonquin Park

4.0 Public Consultation

4.1 Details of Public Consultation

- An Information Notice was published July 13, 2009 to the Environmental Registry website. The information contained in the notice was first published on July 19, 2005 at the Invitation to Participate stage. To view the notice please visit www.ontario.ca/environmentalregistry and search on XB05E3006.
- The Pembroke District Manager letter was sent July 15, 2009 as a general mailing to Madawaska River mailing list. The letter issued a notice of public review of the Draft Madawaska River Water Management Plan (MRWMP). The letter announced the details of the two public information centre sessions to be held August 11, 2009 in Barry's Bay and August 12, 2009 in Arnprior. It highlighted that the draft WMP would be available for public viewing from August 12, 2009 to September 14, 2009 at the MNR Pembroke Office and OPG Office in Renfrew. Additionally copies of the plan would be available on CD Rom or at the Ontario Power Generation Website (http://www.opg.com/safety/water/madawaska.asp). Written comments were to be received by Monday September 14, 2009. The mailing list included adjacent landowners, municipalities and other groups, organizations or individuals who may have had an interest in Madawaska River Water Management Plan, including the following:
  - Standing Advisory Committee Members
  - Area Fish and Game Clubs
  - White-water recreational groups
- Newspaper advertisement of the review of Draft MRWMP, detailing the dates and locations of the two information centres, contact information and the dates of the comment period was placed in the following papers:
  - Renfrew Mercury (July 21, 2009)
  - Eganville Leader (July 22, 2009)
  - Barry's Bay This Week (July 22, 2009)
  - Cobden Sun (July 22, 2009)
  - Pembroke Daily Observer (July 23, 2009)
  - Bancroft Times (July 23, 2009)
  - Arnprior Chronicle (July 23, 2009)
  - Arnprior EMC (July 24, 2009)
  - Madawaska Highlander (July 27, 2009)

- Two Information Centres took place:
  - Tuesday, August 11, 2009
    Barry's Bay Legion, 250 John Street, Barry's Bay, Ontario, from 2-5 p.m. & 7-9 p.m.
    51 people were in attendance
  - Wednesday, August 12, 2009
    Kenwood Centre, 16 Edward Street South, Arnprior Ontario, from 2-5 p.m. & 7-9 p.m.
    9 people were in attendance

- The following summarizes the number of responses received:
  - two filled in comment sheets from the open house sessions thanking us for the information presented.
  - three email requests for a copy of the draft WMP.
  - five written comments received by MNR & OPG during the comment period (extended to September 18, 2009): two emails, one fax, one individual letter, one letter joint submission.

4.2 Summary of Comments

General Comments:

1. One respondent reviewed the draft Madawaska River Water Management Plan in its entirety. Overall impressions were that a great deal of work and effort went into preparing the draft plan and although there is a large volume of information, the way it is presented makes it easy to comprehend. The respondent put forward a large number of editorial changes, comments and suggestions to the plan that will not be outlined in this summary, such as:
   - Inconsistencies in the use of acronyms, use of upper and lower case and punctuation. Comments were provided for the first 12 pages.
   - All maps should have a date on them.
   - Define the term "freshet" in the document.

Reach Specific:
Stewartville Reach

1. A letter was received as a result of the newspaper ad and it was submitted prior to the comment period. Respondent was a long-time resident above the Stewartville dam. The commenter has observed that since new rules and regulations came into place in 2000, OPG no longer wants to work with shoreline property owners.
   1.1. Victoria Long weekend has been the unofficial start to the summer – water levels used to be brought up to summer levels this weekend and it was safe to put in docks. Since 2000, it is difficult to predict when it will be safe to put their dock in for the summer.
   1.2. Use to watch bass spawn in years past and now with the widely fluctuating water levels, it doesn't seem to happen.
   1.3. Water levels fluctuating in the three foot range causes more of the shoreline to be susceptible to erosion due to the wake caused by large boat. If the 10-inch fluctuation margin was maintained, there would be less erosion.

2. A joint submission from property owners of the Stewartville reach was submitted. A group of eight volunteers collected input from approximately 20% of the residents on the reach. Within the group contacted, 95% of people were in support of the issue, areas of concerns, and recommendations put forward. The submission from the Stakeholders on the Stewartville Reach was accompanied by 91 signatures requesting that the 2009 Water Management Plan address the concerns and accept the associated recommendations.
   2.1. The water level vs flow plan needs to be revised as the single flow trigger point of 53.6 cm does not adequately manage the issue of water drawdown from 30 cm to 78 cm on the Stewartville reach. A flow to drawdown rule curve needs to be developed and documented in the 2009 plan that better meets the needs of all reach stakeholders.
   2.2. The plan need to describe the calibration and verification system that is used to ensure gauges are accurate as there is no documented system for this.
   2.3. Current water management needs does not support the spawning needs of bass and bait fish. The 2009 plan needs to accommodate spawning needs of these fish.
   2.4. The 2009 Plan needs to require OPG to table a written report at each Standing Advisory Committee Meeting. The report should include sufficient detail to allow for follow-up and or accountability of actions taken.
   2.5. The 2009 Plan needs to require OPG to provide more detailed forecasting information in a more timely fashion. The suggestion put forward is as follows: Between April 1 and November 30, OPG will update the level and flow forecast weekly by Thursday 12:00 P.M.

Kaminiskeg Lake / Palmer Rapids

1. A respondent put forward one comment related to the minimum flow requirement for Kaminiskeg Lake.
   1.1. The minimum flow requirement should be increased from 10 cms to 15 cms (Table 9.10). In the past, the minimum flow has been 15 cms (prior to WMP 2000), which is a safer white-water recreation flow for kayakers and canoeists. Palmer Rapids is a very popular paddling spot in Ontario. To facilitate the “natural” recreational sport, it would be desirable to increase the minimum limit back to 15 cms to ensure safer passage for paddlers as some will descend on the Palmer Rapid section regardless of flow.

2. Two recommendations were put forward by the Paddler Cooperative Board of Directors. The submission highlighted that the Draft WMP impacts a large and diverse group of recreational paddlers and river users. The amendment requests put forward by this group are intended to illuminate concerns expressed by a large demographic.
   2.1. There is a need for a more accurate understanding of white-water paddling on the Madawaska River. To help achieve this, a new web-based Visitors Survey should be conducted in the summer of 2010. The data based on the 1997 Visitors Survey cannot be expected to accurately reflect recreational use in 2009. New data will help support the objective to “support a range of recreational and tourists uses” in the Effectiveness Monitoring Plan. If properly assessed, it would be apparent that a few thousand people paddle white-water on the Madawaska River, including camps, schools groups, paddling instruction centers, paddling clubs, families and individual paddlers.
   2.2. Request that the minimum water flow be returned to the original 14cms as opposed to the current rate of 10cms for safety reasons. The lower water flow increases the exposure of rocks and can change a safe rapid into a hazardous one.

4.3 Analysis of Comments

General Comments:

Many of editorial comments put forward by the respondent will be addressed and incorporated in the final plan.

Reach specific:
Stewartville Reach

1. Analysis of the comments put forward by the long-time resident located above the Stewartville dam.

   1.1. The use of the 30 or 78 cm range has evolved over the past 30 years. The history and rationale behind the operations of the reach are provided in section 5.2.8.1 of the WMP and is based on the inflow into Mountain Chute. Section 9.2.10 provides details about the operating limits. OPG operates within a 30 or 78 cm range depending on the inflow into Mountain Chute. The inflow varies from year to year and day to day and results in a either a 30 or 78 cm range. OPG provides information about the 30 or 78 cm operating range on a web site or via direct contact with staff using a toll-free number.

   The generating stations on the Madawaska River are peaking power plants that typically run only when there is a high, or peak, demand. The threshold triggered operating range provides a compromise between recreational requirements and Ontario power system requirements. In periods of flow above 53.6 cms recreational users will experience water level fluctuations up to 78 cm so that OPG can meet peak power demands. In periods of flow at or below 53.6 cms recreational users will experience water level fluctuations up to 30 cm and OPG will restrict peaking operations on the Madawaska River.

   1.2. Smallmouth bass have the ability to adapt to fluctuating water levels. This adaptation has been observed in Smallmouth bass in the headponds of the Ottawa River. This evidence would suggest that bass in this section of the Madawaska River would be similar in nature and have adapted to the 78 cm range over the last 30 years.

   1.3. There is no evidence to support the statement that restricting the operating range to a smaller range would reduce erosion. Section 5.1.3 provides a general overview on shoreline erosion. On any system there will be localized erosion, however there is no evidence of any systemic erosion problems along the Stewartville reach. This reach does not appear any different than one would expect from any other section of shoreline.

2. Analysis of the recommendations from property owners of the Stewartville reach:

   2.1. The threshold-triggered operating range provides a compromise between recreational requirements and Ontario power system requirements. The rationale for the suggested change is that between 2000 and 2008, the WMP was not successful because the 30 cm range was used 66% of the time. In some years the 30 cm range occurred 94% of the time. While in other years it was used as low as 46% of the time. The percentage of time is based on the flow threshold which changes from year to year because of the variations in the weather between years.

   Data from 1953 to 1979 provides a perspective on how the river would be operated if recreational concerns were not considered. Recreational preferences were not given significant consideration between 1953 and 1979. The daily average level during the 1953 to 1979 period was above 144.48 m only 30% of the time during the summer period. Based on the flow threshold in the WMP 2009 and the data from the 1953 to 1979 period, OPG would have been required to the restriction operations to the 30 cm range 65% of the time. The use of the flow threshold would double the percentage of time that the 30 cm range is used. The existing compromise has reversed the situation so that OPG only operates in the 78 cm ~30% to 40% of the time.

OPG is willing to investigate the impact of a "flow to drawdown rule curve" on operations of the river.

2.2. OPG adheres to accepted industry standards for gauge calibration. The actual process and method used changes with time and the technology deployed, and will not be included as part of the WMP.

2.3. Based on previous experience, evidence suggests that the bass and baitfish population have adapted to the 78 cm range over the last 30 years and that the 2009 plan does not hinder the spawning needs of these fish. On average, the 78 cm range has been used from April through to mid-to-late June when bass are on their nests. Likely they have adapted to this fluctuation and build their nests deeper similar to areas on the Ottawa River where similar peaking operations have resulted in this adaptation. However MNR is open to investigating with the assistance of the local residents of the Stewartville reach to help determine if impacts exist.

2.4. OPG will provide a written summary of the number and nature of all issues raised by the public for presentation at the SAC meetings as outlined in the terms of reference for the committee.

2.5. OPG has agreed to provide regular updates of the flow and level information. Issue 5.1.7 outlines that regular water level and flow updates can be obtained on the OPG website. The WMP will not be changed to specify a period for updates and a precise time.

Kaminskeg Lake/Palmer Rapids

1. Change in the minimum flow from 10 cms in the draft plan back to the original 15 cms.

1.1. The Madawaska River is operated as a system. Changing the minimum flow to 14.2 cms could have implications on the levels and flows associated with Kamaniskeg Lake and Bark Lake. An information need would need to be carried out before any change can occur.

2. Analysis of the recommendations put forward by the Paddler Cooperative Board of Directors.

2.1. Information Need 7.1.4 covers this requirement. Although the completion of a visitor survey in 2010 is unlikely because of the number of higher priority information needs. This information need will be fulfilled during the implementation of the 2009 plan.

2.2. The Madawaska River is operated as a system. Changing the minimum flow to 14.2 cms could have implications on the levels and flows associated with Kamaniskeg Lake and Bark Lake. An information need would need to be carried out before any change can occur.

4.4 Follow-up / Action

- A response letter will be sent to the five individuals/groups that submitted comments.

5.0 Recommendations for change

Based on the comments received from the public, the following changes will be made to the draft Madawaska River Water Management Plan:

- A new information need will be added to the WMP 2009 for OPG to investigate a flow to drawdown rule curve for the Stewartville reach.
- Wording will be added to section 9, Operating Plan and Compliance Framework, to reflect that OPG uses industry standards for gauge calibration.
- A new information need will be added to the WMP 2009 to investigate if impacts to the baitfish and small mouth bass populations exist on the Stewartville Reach. The Stewartville reach interest group has agreed to provide

assistance with the assessment to demonstrate the issue/concern that has been observed.

- A written summary will be provided by OPG of the number and nature of all issues raised by the public. The status will be amended for Issue 5.1.8, Action 4, to include that OPG will provide a written summary of any pubic issues received by the public at each SAC meeting.
- The completion of a new visitor's survey will be added to the Effectiveness Monitoring Plan (Table 10.1) under the objective of "Support a range of recreational and tourist uses."
- A new information need will be added to determine the implications of re-establishing a 14.2 cm minimum flow at Kamaniskeg Lake.

6.0 Approval of Consultation Documentation

MNR District Contact Person: **Joanna Samson** Pembroke District (613) 732-5593 (Telephone) (613) 732-2972 (Facsimile)	**Waterpower Producer Contact Person:** **Don Ferko** Ontario Power Generation (613) 432-8878 x 3366 (Telephone) (613) 432-9342 (Facsimile)
Paul Moreau District Manager Pembroke District December 1, 2009	**Chris Tonkin** Operating Manager Madawaska Production Group December 1, 2009

APPENDIX E TABLE OF ISSUES / RESPONSE ACTION 5-02

Issue #		Issue Description	Revision
WMP 2000	WMP 2008		
2.3.1	5.1.1	Information Needs	2009
2.3.2	5.1.2	Reduced Angling Opportunities	2009
2.3.3	5.1.3	Shoreline Erosion	2009
2.3.4	5.1.4	Economic Contribution of Tourism	2009
2.3.5	5.1.5	Ontario Power Generation's Right to Arbitrarily Drawdown Reservoirs	2009
2.3.6	5.1.6	What Effect Will Privatization have on Water Management on the Madawaska River	2009
2.3.7	5.1.7	There is a Need to Create Greater Public Understanding of Why and How the River is Operated in the Manner that it is.	2009
2.3.8	5.1.8	Mechanism for Long-Term Public Involvement in Water Management on the River	2009
2.3.9	5.1.9	Effect of Water Level Fluctuations on Shoreline Property Owners	2009
2.3.10	5.1.10	Generating Station/Dam Portage Routes	2009
2.3.11	5.1.11	Access to Water Level Forecasts	2009
2.3.12	5.1.12	Water Level Recording relative to Peak River Use by People	2009
2.3.13	5.1.13	Requests for Flows for Various Uses/Users	2009
2.3.14	5.1.14	Water Management Models	2009
2.3.15	5.1.15	Decision-Making Information	2009
2.3.16	5.1.16	Dam Operating Documents	2009
2.3.17	5.1.17	Protocol for Inter-Agency Communications During Spring Freshet and Walleye Spawning/Incubation	2009
2.3.18	5.1.18	Managing Water Levels to Within Specified Operating Limits in Extreme Wet or Dry Weather Years	2009
2.3.19	5.1.19	Maximum and Minimum Water Level Elevation of OPG Controlled Reservoirs	2009
2.3.20	5.1.20	Mechanism for Addressing Destruction of Fish Habitat	2009
2.3.21	5.1.21	Flow and Water Level Effects on Non-Aquatic Wildlife	2009
2.3.22	5.1.22	Stewardship and Volunteer Opportunities	2009
2.3.23	5.1.23	Alternative Hydro Projects	2009
2.3.24	5.1.24	Need for More Research and Data Collection	2009
2.3.25	5.1.25	Inadequate Control of Tributaries During Spring Runoff	2009
2.3.26	5.1.26	Need for Overall Madawaska River Watershed Plan	2009
New	5.1.27	Process for Plan Amendments	2009
2.12.7	5.1.28	Quality of Fishery above Bark Lake Dam/Fisheries Assessment in Headwater Lakes and Streams	2009
2.12.10	5.1.29	Protocol for Interagency Communications and Decision Making between OPG and MNR for Water Release During Low Water and Dry Weather Periods	2009
New	5.1.30	Degree Growing Days During Walleye Incubation Period	2009
2.4.1	5.2.10.1	Effect of Fluctuations in Water Flows on Fish Populations	2009
2.4.2	5.2.10.2	Flow Regulation to Dilute Effluent from Arnprior Water Pollution Control Centre (WPCC)	2009
2.4.3	5.2.10.3	Flow Regulation to Facilitate Boating and Docking at Chats Lake Yacht Club and Marina	2009
2.4.4	5.2.10.4	Shoreline Erosion	2009

Issue #		Issue Description	Revision
WMP 2000	WMP 2008		
2.5.1	5.2.9.1	Fish Populations in Tributaries of Lake Madawaska	2009
2.5.2	5.2.9.2	Efficiency of Rehabilitation Work on Walleye Spawning Beds and Effect of Flow Management	2009
2.5.3	5.2.9.3	Effect of Testing the Stewartville GS Spillway on Fish Spawning Shoal	2009
2.5.4	5.2.9.4	Deterioration of Existing Shoreline Erosion Protection Works Along Lake Madawaska	2009
2.6.1	5.2.8.1	Mid-Day Water Levels from June to September	2009
2.6.2	5.2.8.2	Water Levels Adversely Affecting Boating and Shoreline Activities	2009
2.6.3	5.2.8.3	Privatizing OPG and Future Water Level Regulation	2009
2.6.4	5.2.8.4	Shoreline Erosion	2009
2.6.5	5.2.8.5	Minimum Flow Requirements for Walleye Spawning in North Channel of River Calabogie GS	2009
2.6.6	5.2.8.6	Effects of Low Flows in the North Channel of the River at Calabogie GS on Boating	2000
2.6.7	5.2.8.7	Limiting Factors to Production of Walleye, Pike, Muskellunge etc.	2009
New	5.2.8.8	Bass Spawn and Baitfish	2009
2.7.1	5.2.7.1	Effects of Water Level Management in Calabogie Lake on Riparians and Boaters	2000
2.7.2	5.2.7.2	Poor Walleye Fishing in Calabogie Lake	2009
2.7.3	5.2.7.3	Walleye Spawning at Barrett Chute GS	2009
2.7.4	5.2.7.4	Spills at High Falls for Walleye Spawning	2009
2.7.5	5.2.7.5	Swimmer's Itch in Calabogie Lake	2000
2.7.6	5.2.7.6	Calabogie Lake Water Quality	2000
New	5.2.7.7	Grassy Bay Herpes	2009
New	5.2.7.8	Grassy Bay Wild Rice Production	2009
2.8.1	5.2.6.1	Effect of Mountain Chute Operations on Water Level Fluctuations and Walleye Spawning 2009	2009
2.9.1	5.2.5.1	Effect of daily and weekly water level fluctuations during the recreation season	2009
2.9.2	5.2.5.2	Effect of Fall High Water Levels at Freeze-up on Riparian Landowners and Shorelines	2009
2.9.3	5.2.5.3	Dry Wells Between Camel Chute and Griffith in Early Spring	2009
2.9.4	5.2.5.4	Pike Spawning Habitat	2000
2.9.5	5.2.5.5	Walleye Spawning Habitat and a Declining Walleye Population	2009
2.9.6	5.2.5.6	Effects of Reservoir Drawdown and Refilling on Riparian Habitats and Wetlands	2009
2.9.7	5.2.5.7	Effects of Spring Flooding and Daily Summer Water Level Fluctuations on Waterfowl	2009
2.10.1	5.2.4.1	Exposed spawning beds	2009
2.10.2	5.2.4.2	Water Releases for Recreational Purposes	2009
2.10.3	5.2.4.3	Drowning of Furbearers	2009
2.10.4	5.2.4.4	Information on Walleye Downstream from Palmer Rapids to Griffith	2000

Issue #		Issue Description	Revision
WMP 2000	WMP 2008		
2.10.5	5.2.4.5	Availability of Water Below Kamaniskeg Lake for Recreation (canoeing, kayaking, rafting, etc.).	2009
New	5.2.4.6	Palmer Rapids Dam Minimum flow requirement	2009
2.11.1	5.2.3.1	Flow requirements for recreational uses	2000
2.11.2	5.2.3.2	Effect of Water Level Fluctuations on Residents and Commercial Tourist Operators	2009
2.11.3	5.2.3.3	Narrow Operating Limits (+/- 6 cm) on Kamaniskeg Lake in the Summer	2009
2.11.4	5.2.3.4	High water Level Elevations Below Bark Lake Dam During Fall/Winter Drawdown	2009
2.11.5	5.2.3.5	Augmented Late-Winter/Spring Flows on Kamaniskeg Lake	2000
2.11.6	5.2.3.6	Effect of Water Level Regulation on Productivity of Aquatic Species and Furbearers at Conroy's Marsh	2009
2.11.7	5.2.3.7	Effect of Winter Drawdown on Muskrat in Conroy's Marsh	2009
2.11.8	5.2.3.8	Erosion at Bells Rapids	2009
2.11.9	5.2.3.9	Information on Negeek Lake	2009
2.11.10	5.2.3.10	Impact of Flows out of Bark Lake	2009
2.12.1	5.2.2.1	Bark Lake Dam Flows	2000
2.12.2	5.2.2.2	Effect of Water Level Fluctuations on Riparians	2009
2.12.3	5.2.2.3	Flooding at Madawaska Village when Bark Lake is at its Maximum Elevation	2009
2.12.4	5.2.1.2	Bank Erosion Upstream of Bark Lake	2009
2.12.5	5.2.2.4	Narrow Operating Limits (+/- 6 cm) on Bark Lake in the Summer	2009
2.12.6	5.2.2.5	Destruction of Lake Trout Population in Bark Lake	2009
2.12.7	5.1.27	Quality of Fishery above Bark Lake Dam/Fisheries Assessment in Headwater Lakes and Streams	2009
2.12.8	5.2.1.1	Algonquin Provincial Park Water Levels	2009
2.12.9	5.2.2.6	Effects of Winter Drawdown on Furbearers in Bark Lake	2000
2.12.10	5.1.29	Protocol for Interagency Communications and Decision-Making between OPG and MNR for Water Release During Low Water and Dry Weather Periods	2009
2.12.11	5.2.2.7	Need to Undertake a Study to Determine the Impact of the 1999 Record Low Water Levels on Fish and Wildlife in Bark Lake	2009
New	5.2.2.8	Bark Lake Pre-Freeze Up Drawdown	2009
New	5.5.1	Minimum Flow Requirement	2009
New	5.5.2	Change in water level measurements from inches to tenths of a foot	2009
New	5.5.3	Rule curve deviations, over-winter target level	2009
New	5.5.4	Facilitate pike spawning	2009
New	5.5.5	Increase to target level for power production	2009

APPENDIX F DISSENTING OPINIONS

No dissenting opinions have been documented to date in preparation of the Madawaska River Water Management 2009.

APPENDIX G SUMMARY OF COMMUNICATION WITH FIRST NATIONS

Dialogue with Aboriginal communities in the Madawaska Watershed has been a separate and parallel process from public consultation. The Algonquin's of Ontario (AOO) have been notified on several occasions during update/review of this WMP.

- In June 2007, the AOO were notified that the MNR and OPG were in the process of updating/reviewing the Madawaska River Water Management Review Final Report (2000) to conform, where possible, to the Water Management Planning Guidelines for Waterpower (2002). They were informed that the update would take into account the existing waterpower facilities and control structures within the watershed. Copies of the 2000 WMP were provided and their involvement in the process was requested. These copies were delivered to the AOO consultant and to the Chief of the Algonquins of Pikwakanagan as per the protocol that existed at that time.
- In July 2009, prior to the commencement of the public consultation process, the AOO were notified that the existing Madawaska River Water Management Review document had been updated and that a draft plan would soon be available for review. A meeting was requested with the Algonquin's Negotiation Representatives to discuss the draft 2009 WMP and any concerns they may have.
- In response, the AOO indicated to MNR that they were interested in discussing the WMP among a number of other topics, in particular new waterpower proposals within the Algonquin Land Claim area. The proposed date from the AOO could not be accommodated and MNR requested on July 22, 2009 an alternate meeting date. No alternate date was put forward to the local office to accommodate this specific subject.
- In August 2009, copies of the draft 2009 WMP were made available to the AOO and the offer to schedule a meeting to discuss and explain the plan and for them to provide input was once again made. They were informed at that time that the development of new waterpower facilities was outside of the scope of water management plans and that new facilities must go through a site release and/or approvals and permitting process. New sites for development would be consulted on with the AOO.
- Further attempts were made in the fall of 2009 to set a meeting date to discuss the draft water management plan. The AOO indicated that they were interested in meeting with senior management of MNR and MEI to discuss the Green Energy Act and renewable energy projects within the Algonquin Land Claim Area. A meeting to discuss the draft plan was not a priority for the AOO at that time.
- In December 2009, the AOO sent a letter to MNR regarding the WMP and raised a number of questions in their correspondence. In particular, they were interested in whether the WMP was considered a senior level document and if it would supersede the Forest Management Plan (FMP). They were also interested in specifics around Algonquin attendance at future meetings.
- In January 2010, MNR responded to the letter and indicated that the WMP is not a senior document and that it was updated/reviewed under the authority of the Lakes and Rivers Improvement Act (LRIA). MNR indicated that there is no policy or legislative link between the WMP and the FMP and therefore one does not supersede the other. Additionally, information about the Madawaska River Standing Advisory Committee was provided. An invitation was extended for an AOO representative to take part in this committee which will assist MNR and the waterpower proponents with the implementation of the 2009 WMP. MNR also indicated in this letter that the completion of the update/review of the MRWMP is on target for the spring of 2010. An offer to meet to clarify our answers to their questions and for them to provide input into the draft plan was once again made.
- In March 2010, the AOO verbally informed MNR that they were willing to meet later in the spring regarding a number of initiatives, including the WMP; however, MNR has been unsuccessful in scheduling this meeting as of the approval of this plan.

- MNR will endeavour to ensure that ongoing discussions continue and that First Nations involvement in the implementation and subsequent reviews of the Madawaska River Water Management will occur.
- The AOO will continue to be welcomed as participants on the Standing Advisory Committee for the approved Water Management Plan for the Madawaska River. The primary interest of the AOO continues to be focused on the development of new facilities and the AOO have been assured most recently in a meeting on February 17, 2010 that they would be actively engaged in consultation of such new facilities and that the Water Management Plan for the Madawaska River would move ahead. The differences in the processes will be discussed anytime at the AOO request. The approval of the Madawaska River Water Management Plan does not affect any asserted Aboriginal Right as it is a plan only and does not have any elements of new development.

APPENDIX H FLOW & LEVEL HISTORY

The Level and flow history is summarized at the eight locations. The data for the period of record is summarized on a daily basis. A statistical summary (minimum, average and maximum) of the daily data is shown in each figure.

The minimum value for a given day is represented by the bottom of the grey shaded area on each figure. This value represents the minimum flow or level for each day of the year. For example at Bark Lake (Figure H.1), the minimum level on February 1 is 305.40 m. The minimum value selecting the lowest elevation from all the February 1 levels (1-Feb-1944, 1-Feb-1945 … 1-Feb-2008).

The average value for a given day is represented by the dark grey line in middle of the grey shaded area on each figure. The maximum value for a given day is represented by the top of the grey shaded area on each figure.

Figure H1: Bark Lake Flow and Level History

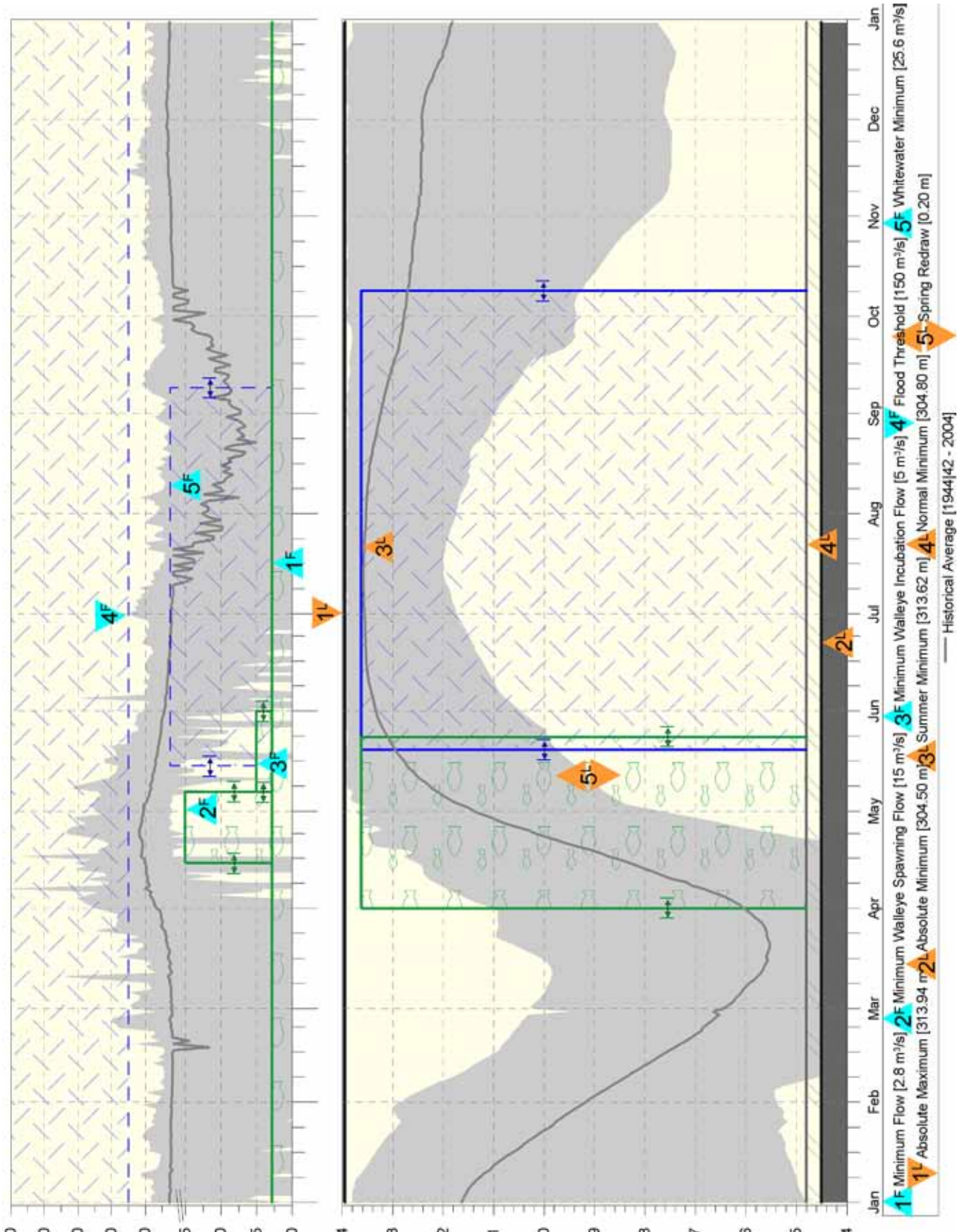


Figure H1 – Bark Lake Flow and Level History

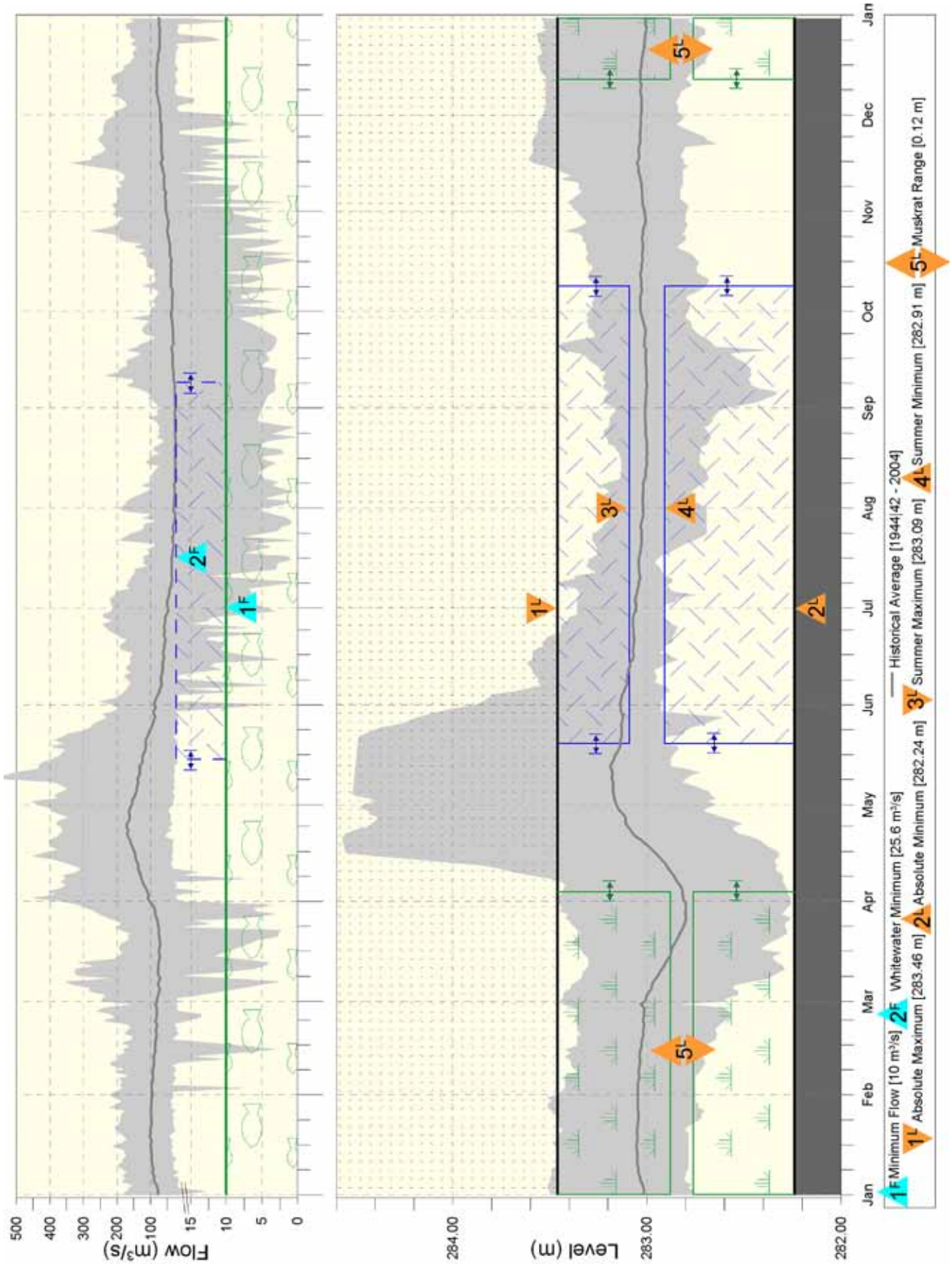


Figure H3: Mountain Chute Flow and Level History

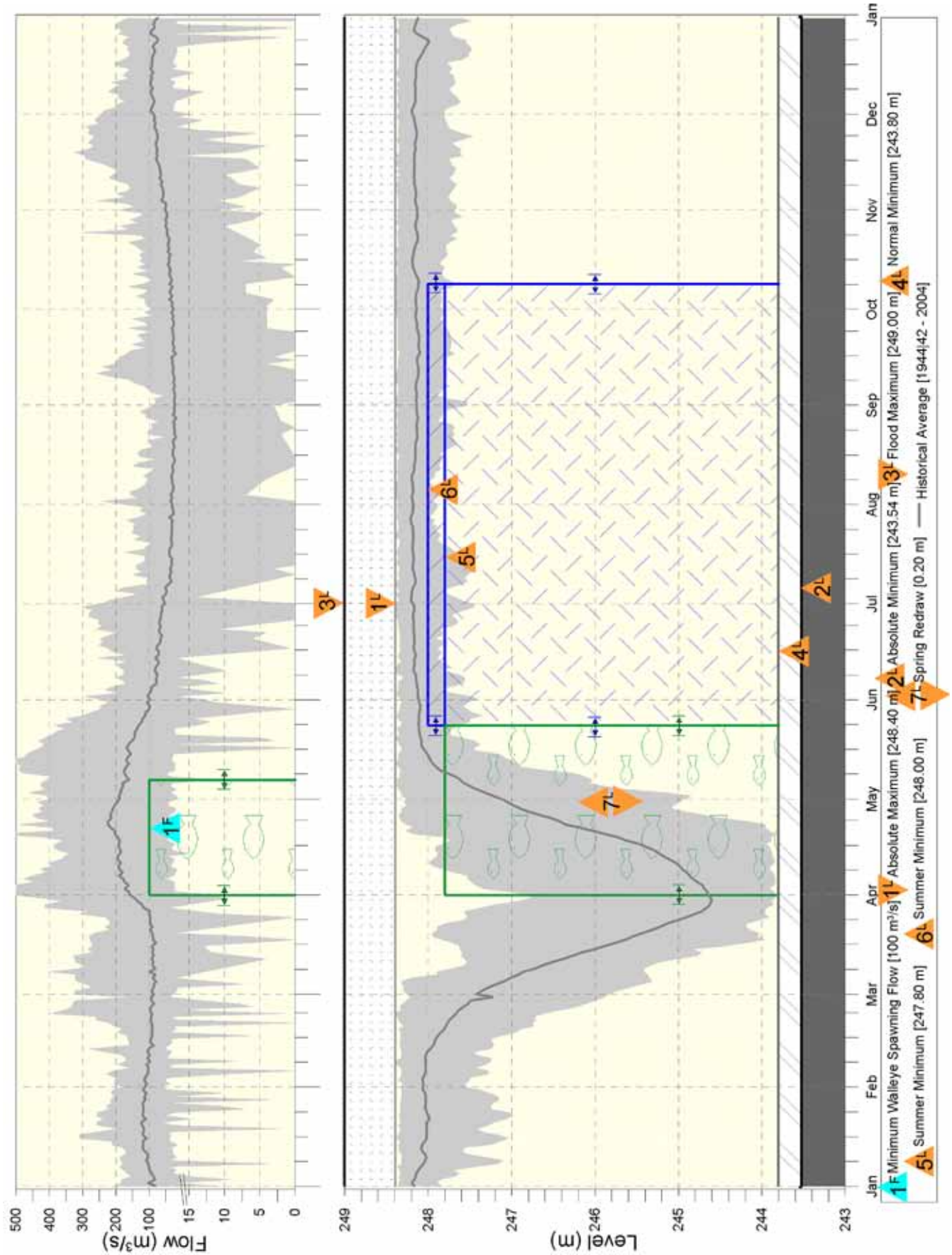


Figure H4: Barrett Chute Flow and Level History

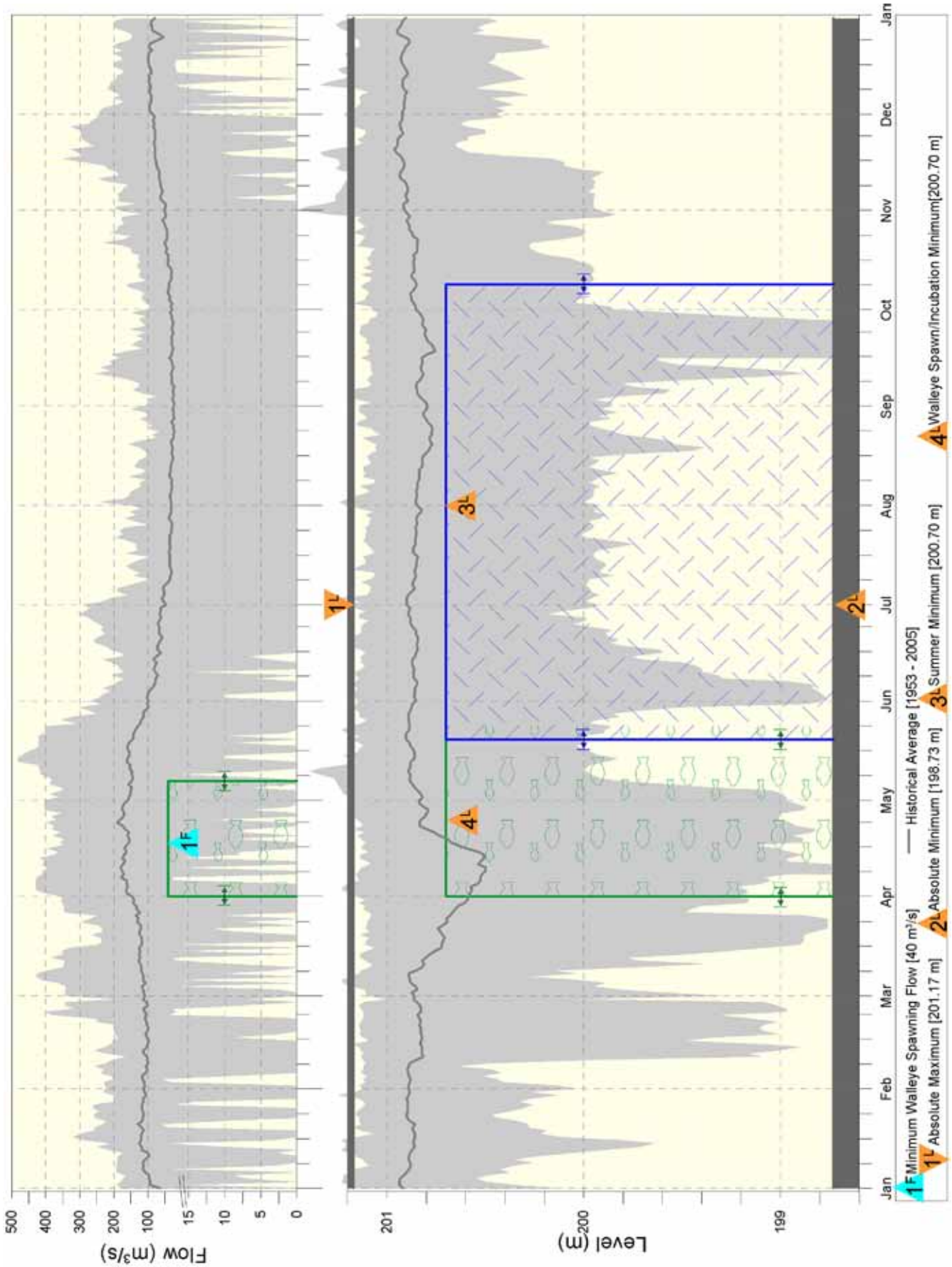
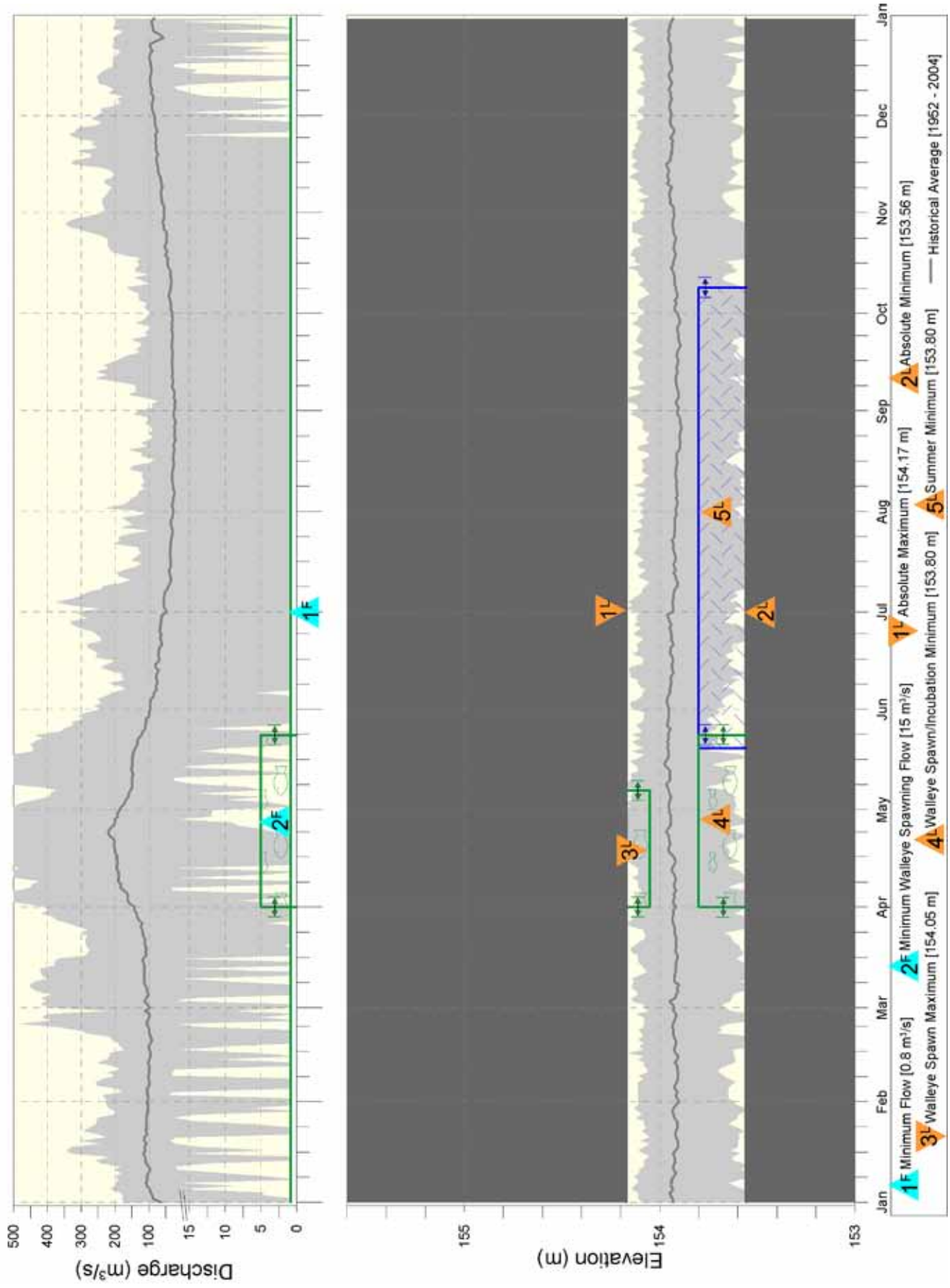


Figure H5: Calabogie Flow and Level History



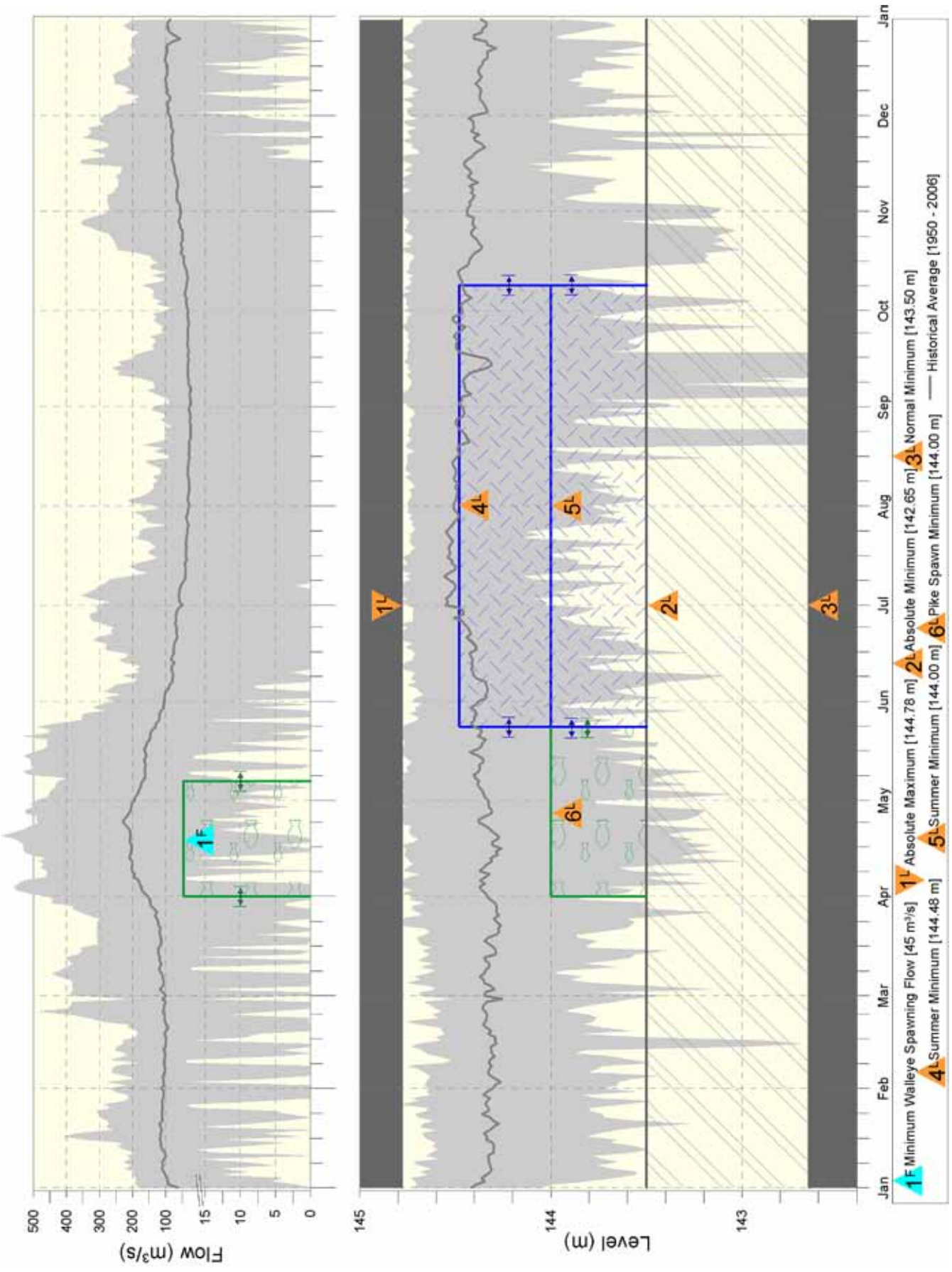


Figure H6: Stewartville Flow and Level History

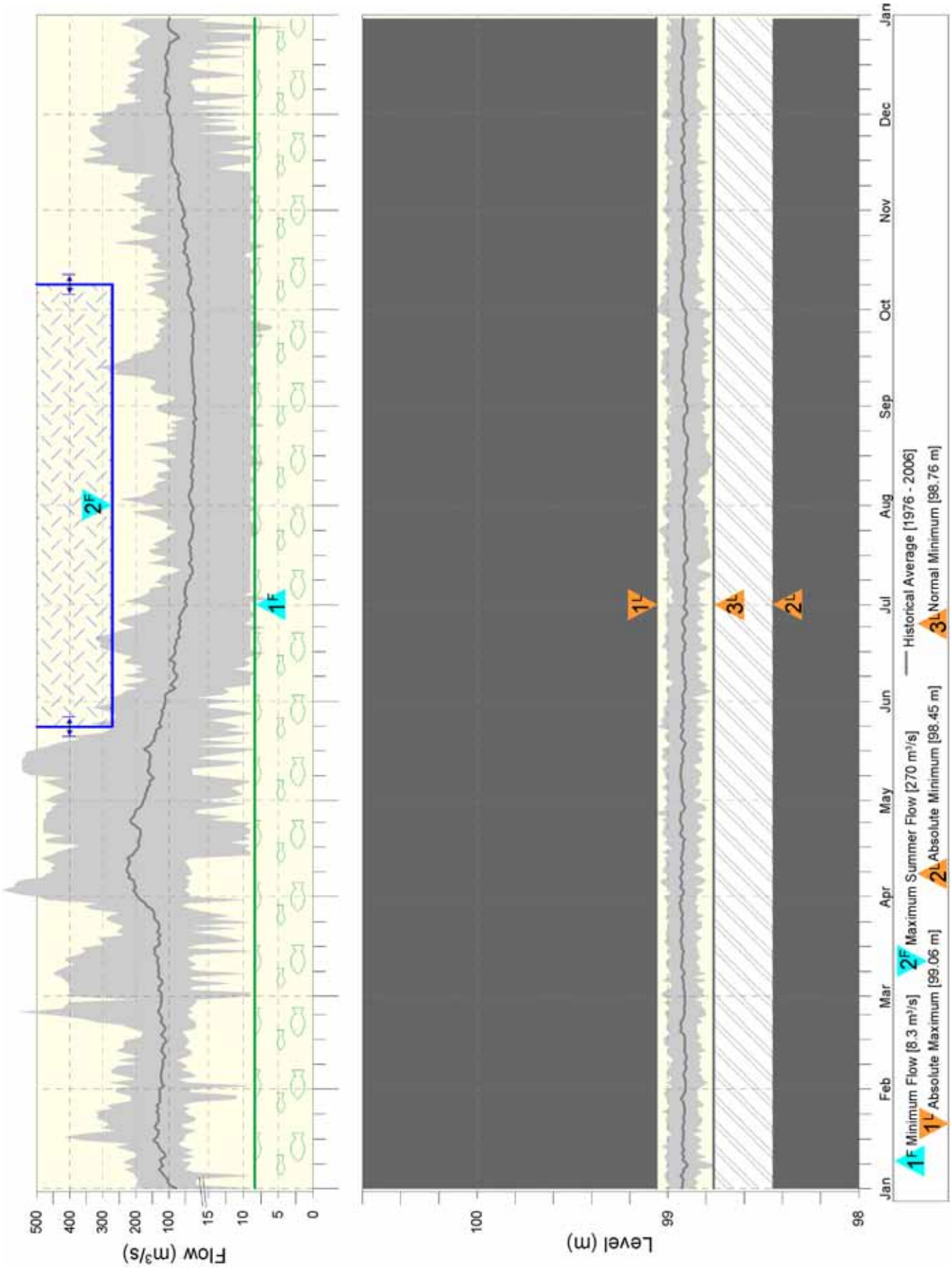


Figure H7: Arnprior Flow and Level History

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