Ministry of Natural Resources

Guelph Area Team
1 Stone Road West
Guelph, Ontario
N1G 4Y2

Ministère des Richesses naturelles

Telephone: (519) 826-4955
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Ontario

June 23, 2005

Dwight Boyd
Grand River Conservation Authority
400 Clyde Road
Cambridge, Ontario
N1R 5W6

Re: Signed copies of the Water Management Plans for the Guelph Dam Generating Station, Shand Dam Generating Station, and the Conestogo Dam Generating Station

Dear Mr. Boyd,

We are pleased to enclose copies of your approved water management plans for the Guelph Dam Generating Station, the Shand Dam Generating Station, and the Conestogo Dam Generating Stations. Please keep these copies for your files. If you have any questions please contact George Booth at (519) 826-4910.

Sincerely,

Michelle McGill

Michelle McGill
Guelph Area Office
(519) 826-4909

File W.4.14.1.1

Water Management Plan

For Waterpower

Shand Dam Generating Station

January 2005

WATER MANAGEMENT PLAN FOR WATERPOWER

for the

Shand Dam Generating Station on the

Grand River

Guelph District, South Central Region
Grand River Conservation Authority

for the ten year period April 1, 2005 to March 31, 2015

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

Paul Emerson, CEO Grand River Conservation Authority — Date
I have authority to bind the corporation.

I certify that this water management plan has been prepared in accordance with *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.

Craig Selby, Guelph District Manager — Date

Approved by:

Ron Running, Regional Director

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

This water management plan (WMP) 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 Market Operator (IMO) requests that owners of the waterpower facilities and associated water control structures seek relief from certain provisions of this WMP, the Ministry of Natural Resources (MNR) will consider those requests expeditiously and, after consultation with the IMO, may allow short-term relief from certain provisions.

The mandatory provisions of this WMP 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.

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 WMP 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 the water management plan does not grant an operator the right to flood the lands of another without the person's consent or authorize the infringement of the rights of others.

Table of Contents

1.0 Introduction

1.1 Plan Goal and Principles

It is the intent of this Water Management Plan (WMP) to follow the goals and principles set out in the Ontario Ministry of Natural Resources (MNR), Water Management Planning Guidelines for Waterpower, 2002.

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.

The following principles will guide planning through the preparation, review, approval and implementation of a water management plan.

- Maximum net benefit to society
- Riverine ecosystem sustainability
- Planning based on best available information
- Thorough assessment of options
- Adaptive management
- Timely implementation of study findings
- Aboriginal and treaty rights
- Public participation

A more detailed description of these principles is available in the MNR, Water Management Planning Guidelines, 2002 page 13.

1.2 Terms of Reference for Water Management Planning

This water management plan has been prepared according to Terms of Reference for the Shand Dam Generating Station included in the Scoping Report for this facility (Appendix D).

1.3 Water Management Plan Objectives

The objectives of the WMP for the Shand Dam Generating Station are:

a) Review, document and understand the hydro facility operations relative to environmental, social and economic benefits;
b) Establish the level of control that the facility exercises over levels and flows;
c) Determine the zone of influence of the hydropower facility;
d) Document resource values and environmental, social and economic issues within the zone of influence of the hydropower facility; and
e) Establish whether a change in hydropower operation (water levels and discharge flows) would have a net environmental, social and economic benefit.

2.0 Physical and Biological Description

The Shand Dam is located on the Grand River upstream of the Town of Fergus at the outlet of Belwood Lake. The dam is accessed via Wellington County Road 18 in Belwood Lake Conservation Area. Shand Dam, the Shand Dam Generating Station and Belwood Lake Conservation Area are all owned and operated by Grand River Conservation Authority (GRCA). Belwood Lake Conservation Area is a day-use park with special emphasis on angling opportunities. Belwood Lake is 12 km long and was created with the construction of Shand Dam in 1942. The dam was the first of its kind built in Canada for both water conservation and flood protection purposes. Park visitors can stand on the top deck of the dam and see the vista of the Grand River valley below. A stairway along the face of the dam allows visitors to walk down to its base.

The Grand River Watershed begins near Dundalk, Ontario, south of Georgian Bay. The river begins on a rolling plain and continues for 290 km draining into Lake Erie. The watershed itself descends a total of 352 m. The tributaries for the Grand River are the Nith, Conestogo, Speed and Eramosa Rivers. The watershed includes Luther Marsh, Elora Gorge, sand hills, moraines and a Carolinian forest which is a rare community in Canada. The Grand River Watershed drains a total of 6,965 km^2 of land and is Southern Ontario's largest watershed (see Appendix A). The Grand River was designated as a Canadian Heritage River in 1994 due to its natural heritage features and historical importance to Ontarians.

2.1 Hydropower Facility Zone of Influence

The "zone of influence" refers to the portion of the watershed that may experience changes in water levels and flows as a result of the hydro facility operation.

With respect to water levels upstream and downstream of the facility, water levels in the reservoir are not manipulated for hydro power production. Upstream levels in the reservoir are maintained within the predetermined seasonal levels as managed by the GRCA. The hydro turbine has been sized to discharge the normal range of summer flows needed to meet downstream low flow requirements. Therefore, the zone of influence is limited to the area immediately upstream and downstream of the facility (see Appendix C).

2.2 Resource Values and Issues

During the scoping phase of the planning process, the steering committee identified a number of economic, social and environmental values associated with the dam that have been included in the Scoping Report (Appendix D). Values associated with the Shand Dam are not within the scope of the Water Management Plan as the dam is not operated for the generation of hydropower. The only resource value associated with the hydropower facility was the economic benefit associated with the generation of

hydropower that is sold for use on the area grid, and provides power to the local community.

During the scoping phase of the water management planning process, no issues were identified associated with the operation of this facility as it pertains to flows and levels.

3.0 Waterpower Facility and Other Water Control Structures

3.1 Brief Description of Waterpower Facility

Hydro generation began at the Shand Dam Generating Station in 1985 with the installation of a vertical propeller hydro turbine. In the Shand Dam infrastructure, one 48 inch valve was retrofitted to accommodate the hydro turbine. The design of the hydro turbine was constrained by the physical infrastructure and the normal discharge patterns.

The hydro turbine has been sized to discharge the normal range of summer flows needed to meet downstream low flow requirements. Therefore, under normal operating conditions, discharge from Shand Dam is through the hydro turbine on a constant basis.

When the turbine was installed, an automatic valve operator was installed on the remaining 48 inch valve. This valve operator opens the 48 inch valve to a predetermined setting in the event of an unscheduled turbine shutdown. This ensures discharge is maintained downstream of Shand Dam in the event of a turbine shutdown (see Appendix B).

3.2 Brief Description of the Shand Dam

The Shand Dam is a multi-use water control structure. The primary objectives of dam operations is to reduce flood damage downstream, to provide low-flow augmentation during dry periods of the year and to ensure that there is adequate flow to dilute wastewater and provide a water source for the City of Brantford, Kitchener and Ohsweken. Auxiliary benefits derived from these dams include recreation and hydro production

The Shand Dam is an earth embankment dam with a concrete control structure. The control structure is composed of 4 gates, two-48 inch valves and one-66 inch valve.

4.0 Current Operations

The current rule curve and operating policy for GRCA reservoirs dates back to 1978. On February 8, 1978, a committee made up of representatives from MNR, the Ministry of the Environment (MOE) and the GRCA reviewed and recommended the present day general operating procedures and operating guidelines. These procedures and operating guidelines incorporated the recommendations of the 1974 Flood Inquiry.

In 1982, the rule curve and operating guidelines were reviewed and revised to implement the recommendations of the 1982 Grand River Basin Water Management Study (MOE). These revisions related to downstream low flow operating targets. Reservoir operating policies and procedures for major reservoirs in the Grand River watershed were updated in February 2004 and the report was approved by GRCA's board in February 2004.

The low flow operating targets were established as part of the Grand River Basin Water Management Plan. They were established for water supply and pollution abatement purposes. During the summer and fall months the major dams are operated to meet downstream low flow targets.

As part of the dam design, a hydro generating turbine has been fit into an existing water control valve. The Operations of the Shand Dam are guided by a Rule Curve that was initially developed as part of the 1982 Grand River Basin Water Management Study.

The maximum production of the hydro turbine is 600 KW. The dam itself is 22.5 m high with a maximum storage of 63,745,000 m^3. The turbine is able to discharge 3-7 m^3/s.

4.1 Maintenance as it is Related to Operations

Provisions are in place to automatically supply flow if there is an unscheduled shutdown of the turbine. If the turbine shuts down, staff are deployed to the site to investigate. At this point discharge is supplemented by auxiliary means automatically (e.g. bypass valve opens or 48 inch valve is opened). Staff inspect the turbine a minimum of once per day to confirm normal operations and to check for any leaks or abnormal operating conditions.

5.0 Information Gaps, Priorities and Programs

An adequate data collection method is in place to monitor the facility and provide adequate data for managers concerning water levels and discharges and dam operations.

6.0 Operating Plan

The hydropower facility will continue to operate and generate hydropower in response to, or within the operating rule curve of the Shand Dam operations.

7.0 Plan Enforcement and Compliance

The regulation of flows and levels associated with this facility are determined by the operation of the Shand Dam by the Grand River Conservation Authority. Since the Shand Dam Generating Station does not significantly affect water levels and flows an operating range has not been identified for this facility, and thus there are no requirements for reporting flows and levels by the facility operator.

8.0 Provisions for Plan Reviews, Amendments, and Plan Renewals

This plan has a term of ten years, from April 1st, 2005 to March 31st, 2015. The first plan review will commence no later than March, 2013. Subsequent reviews of the plan will be carried out as required and as determined by MNR and waterpower producers. The review will involve public consultation through the ***Environmental Bill of Rights*** Registry (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.

Amendments to the WMP can also be made during the term of the plan provided the outcomes remain consistent with the goals and objectives of the WMP.

Three categories of amendments are provided:

- Administrative
- Minor
- Major

The amendment process involves:

a) Submission of a request for an amendment.
b) Review of the request by the MNR District Manager, with advice from the Steering Committee.
c) Acceptance or denial of the request.
d) If acceptance, assignment of a category to the amendment.
e) Completion of all applicable planning requirements, including public consultation.
f) Record-keeping requirements.

8.1 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 water management plan 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 water management plan.

8.2 Review of Amendment Request and Categorization of Amendments

The 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 assess the appropriate extent of public consultation and MNR review and approval necessary.

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

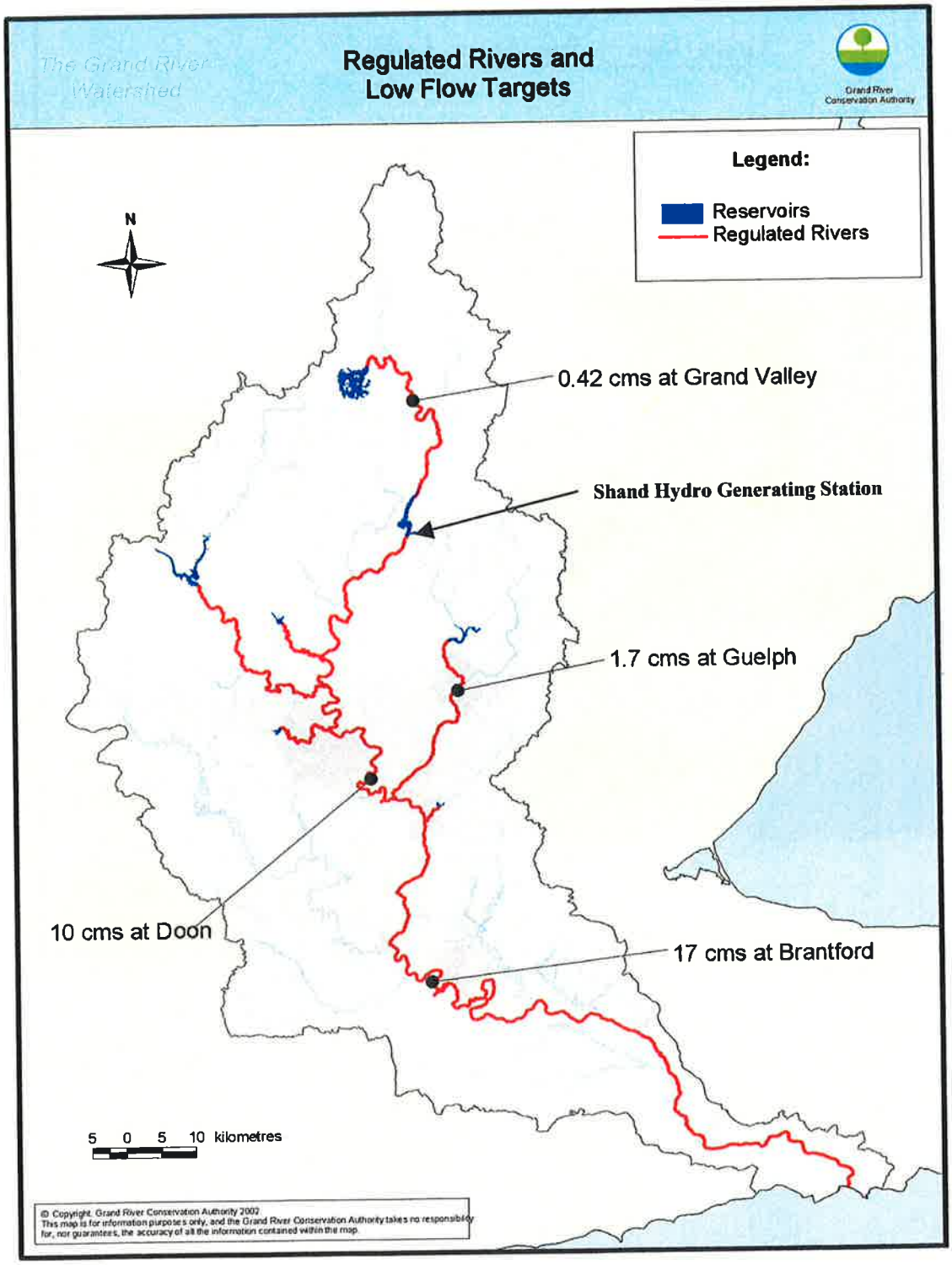
- Whether there are legitimate time constraints which must be met for reasons of public safety, biological or industrial necessity, or public convenience and necessity.
- Whether there has been previous notification that the requested amendment will be required, and the degree to which planning and public 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.

The decision on the amendment request, and the appropriate category of amendment, will normally be made within 30 days of receipt of the request. 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.

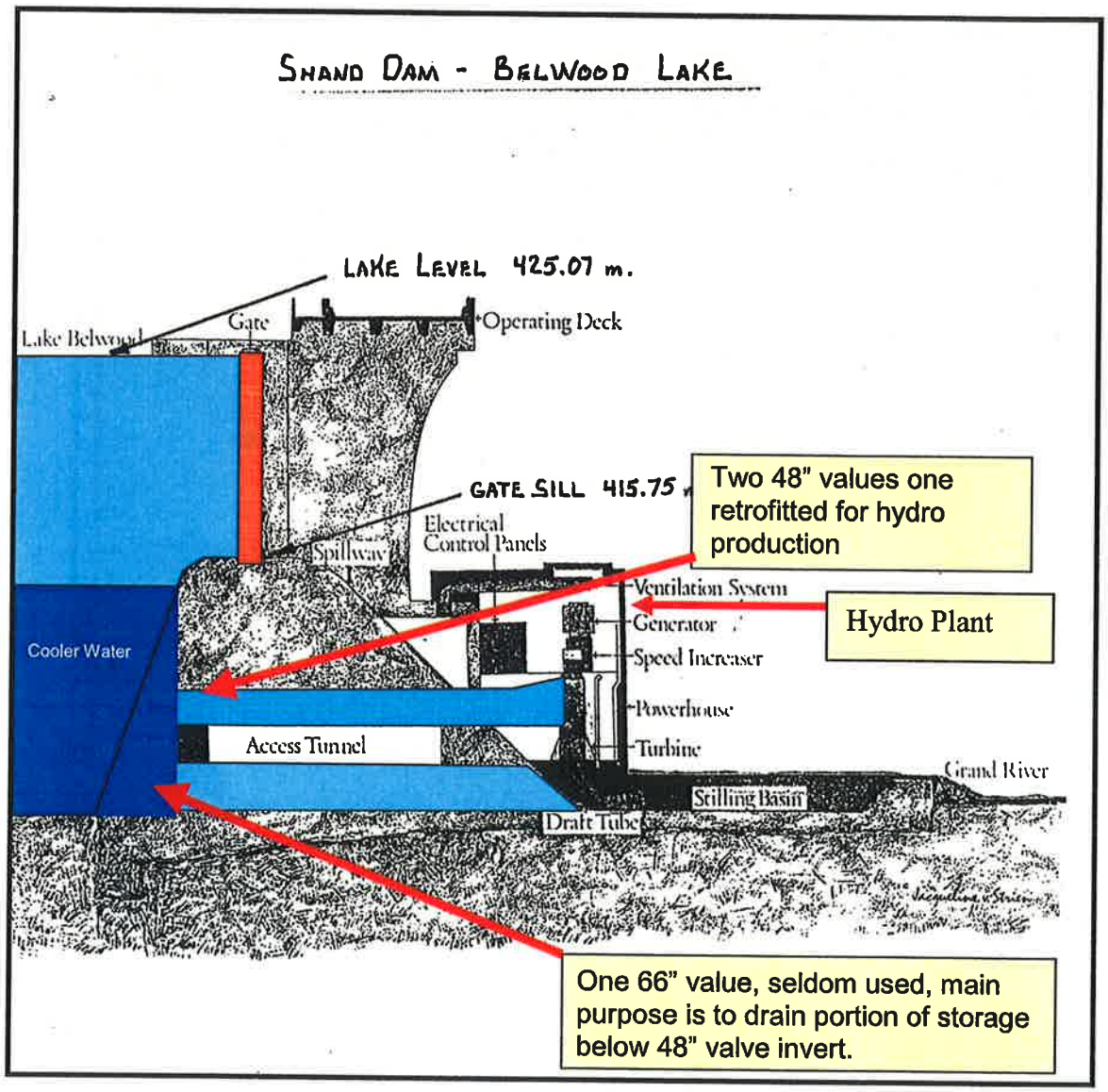
8.3 Amendment Records and Distribution

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.

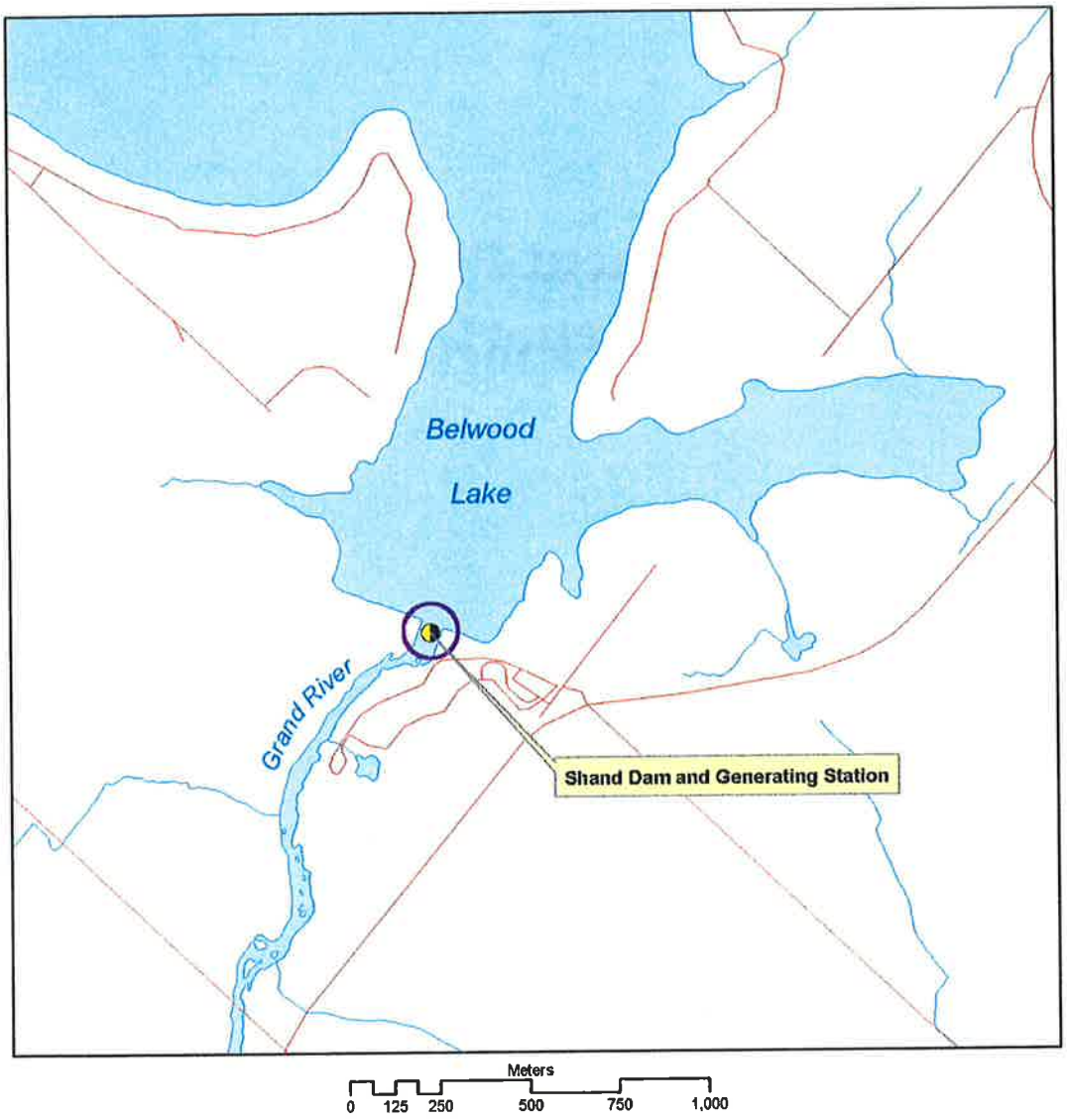
Appendix A – Shand Dam Generating Station, Grand River Watershed



Appendix B – Shand Dam Generating Station Site Plan



Appendix C – Shand Dam Generating Station, Zone of Influence



Legend

- Hydroelectric Generating Station
- Zone of Influence

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Published November 22, 2004 by Guelph District GIS Unit, Ministry of Natural Resources.

Ontario

Water Management Planning
Scoping Report

To fill the Requirements of Section 23.1
of the Lakes & Rivers Improvement Act

October 2004

For the Hydro Generating Site at the

Shand Dam

Operator / Owner
Grand River Conservation Authority

Compiled by the Steering Committee

Ministry of Natural Resources

Ministère des Richesses naturelles

Guelph District
1 Stone Road West
Guelph, Ontario
N1G 4Y2

Telephone: (519) 826-4955
Facsimile: (519) 826-4929

October 4, 2004

The people listed below have reviewed the Scoping Report for the Simplified Water Management Plan of the Shand Dam hydro generating facility. The undersigned agree with the information present in the plan and the site classification of "Category A" for the Shand Dam hydro generation facility.

Signatures

The undersigned have read and agreed to the content of the scoping report below.

APPROVED: Original signed by _____ Date:
George Booth, MNR Steering Com. Rep.

APPROVED: Original signed by _____ Date:
Cora Sheppard, MNR Steering Com. Rep.

APPROVED: Original signed by _____ Date:
Dwight Boyd, Grand River Conservation Authority
Waterpower Co. Steering Com. Rep.

ACCEPTED: Original signed by _____ Date:
Craig Selby
District Manager
Ministry of Natural Resources
Guelph District

ACCEPTED: Original signed by _____ Date:
Doug Unsworth
Regional Waterpower Program Coordinator
Ministry of Natural Resources
Southern Region

Table of Contents

List of Figures & Tables

Steering Committee

The Steering Committee included Cora Sheppard and George Booth from the Ministry of Natural Resources' (MNR) Guelph Area Office and Dwight Boyd of the Grand River Conservation Authority (GRCA).

Water Management Plan Objectives

The objectives of the Water Management Plan (WMP) for the Shand Dam hydropower facility are to:

f) Review, document and understand the hydro facility operations relative to environmental, social and economic benefits;
g) Establish the level of control that the facility exercises over levels and flows;
h) Determine the zone of influence of the hydropower facility;
i) Document resource values and environmental, social and economic issues within the zone of influence of the hydropower facility; and
j) Establish whether a change in hydropower operation (water levels and discharge flows) would have a net environmental, social and economic benefit.

Terms of Reference

This scoping report has been prepared in accordance with the Terms of Reference which are included in Appendix A.

Watershed Description and Site Location and Access

Figure 1. Aerial Photo of Shand Dam

The Grand River Watershed begins near Dundalk, Ontario, south of Georgian Bay. The river begins on a rolling plain and continues for 290 km draining into Lake Erie (Figure 2). The watershed itself descends a total of 352 m. The tributaries for the Grand River are the Nith, Conestogo, Speed and Eramosa Rivers. The watershed includes Luther Marsh, Elora Gorge, sand hills, moraines and a Carolinian forest which is a rare community in Canada. The Grand River Watershed drains a total of 6,965 km^2 of land and is Southern Ontario's largest watershed. The Grand River was designated as a Canadian Heritage River in 1994 due to its natural heritage features and historical importance to Ontarians.

Because a watershed is an ecosystem with natural borders, it includes and crosses many township and county boundaries including the Dundalk, Grand Valley, Waterloo, Kitchener, Guelph, Paris, Brantford, Ohsweken, Taquanyah, Caledonia, York, Dunnville and Port Maitland areas.

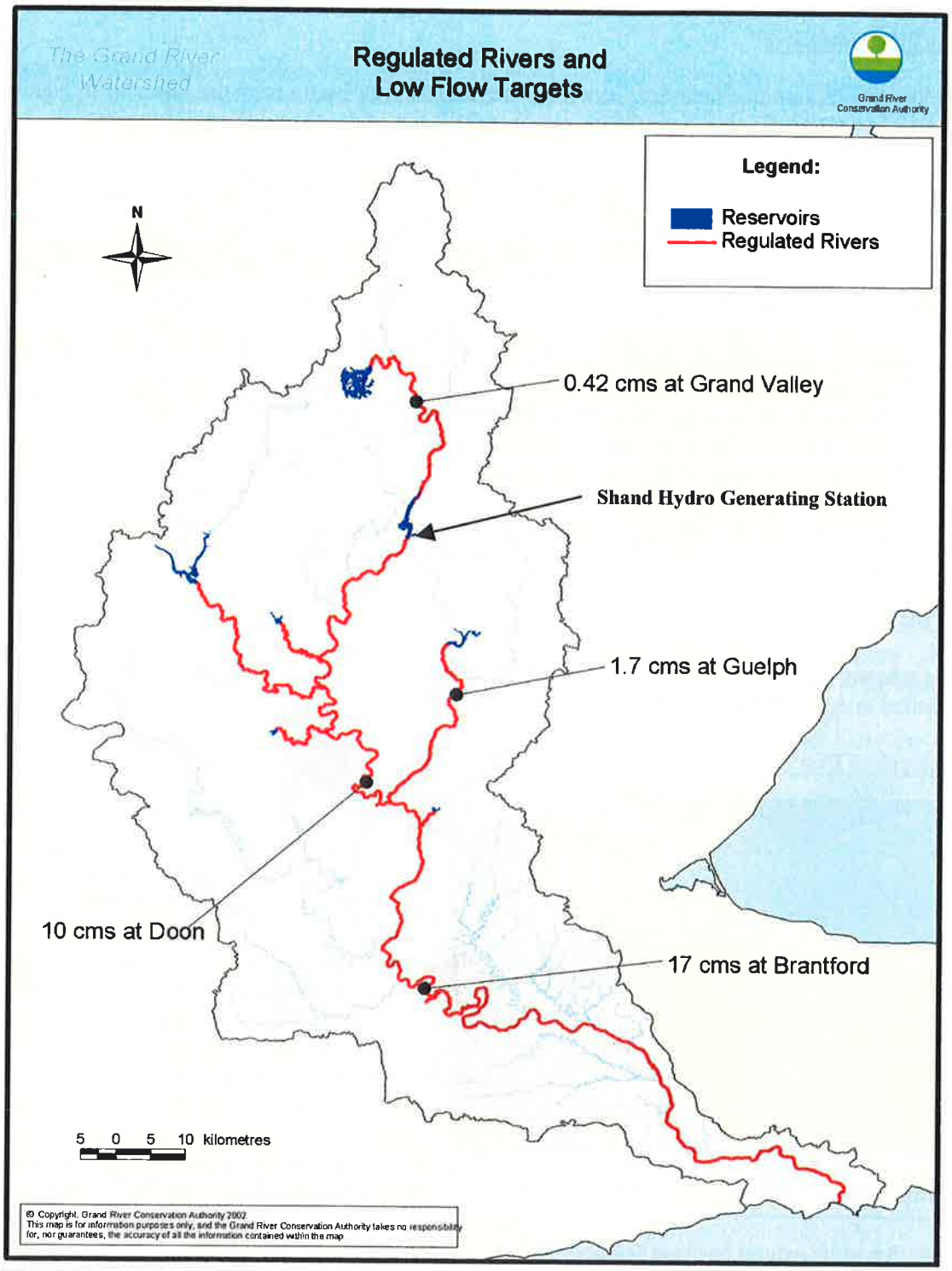

Figure 2. Grand River Watershed (Regulated Reaches and Low Flow Targets)

The Grand River Conservation Authority owns and operates several dams and water control structures in the watershed to carry out their duties under the *Conservation Authorities Act*. There are three dams in the system that incorporate hydro generating turbines into the structure.

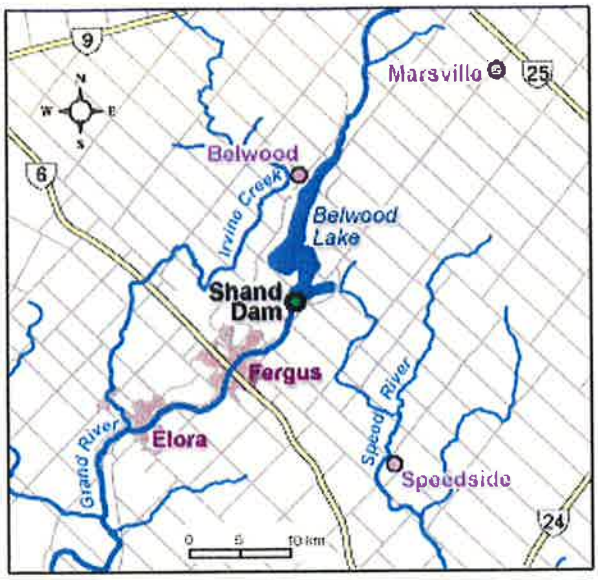

Figure 3. Shand Dam Locator Map

Although the hydro generating structures are associated with dams, it should be noted that the dams are not operated for the benefit of hydro-electricity generation. These three hydro generating structures are located with the Shand Dam, north of the Town of Fergus, Conestogo Dam, near the village of Drayton and Guelph Dam, located upstream of the City of Guelph. Additionally, Wilkes Dam is owned by the GRCA and facilitates the production of hydro by the City of Brantford. All of these dams are designed primarily as water control structures to provide low flow augmentation and to reduce flooding damage in the Grand River system.

The Shand Dam is located on the Grand River upstream of the Town of Fergus (Figure 3). The dam is accessed via Wellington County Road 18 in Belwood Lake Conservation Area.

Background Information

The Shand Dam is a multi-use water control structure. The primary objectives of dam operations is to reduce flood damage downstream, to provide low-flow augmentation during dry periods of the year and to ensure that there is adequate flow to dilute wastewater and provide a water source for the City of Brantford, Kitchener and Ohsweken. Auxiliary benefits derived from these dams include recreation and hydro production.

As part of the dam design, a hydro generating turbine has been fit into an existing water control valve. The Operations of the Shand Dam are guided by a Rule Curve (Figure 4) that was initially developed as part of the 1982 Grand River Basin Water Management Study.

The current rule curve and operating policy for GRCA reservoirs dates back to 1978. On February 8, 1978, a committee made up of representatives from MNR, the Ministry of the Environment (MOE) and the GRCA reviewed and recommended the present day general operating procedures and operating guidelines. These procedures and operating guidelines incorporated the recommendations of the 1974 Flood Inquiry.

In 1982, the rule curve and operating guidelines were reviewed and revised to implement the recommendations of the 1982 Grand River Basin Water Management Study (MOE). These revisions related to downstream low flow operating targets. Reservoir operating policies and procedures for major reservoirs in the Grand River watershed were updated in February 2004 and the report was approved by GRCA's board in February 2004.

The low flow operating targets were established as part of the Grand River Basin Water Management Plan. They were established for water supply and pollution abatement purposes. During the summer and fall months the major dams are operated to meet downstream low flow targets.

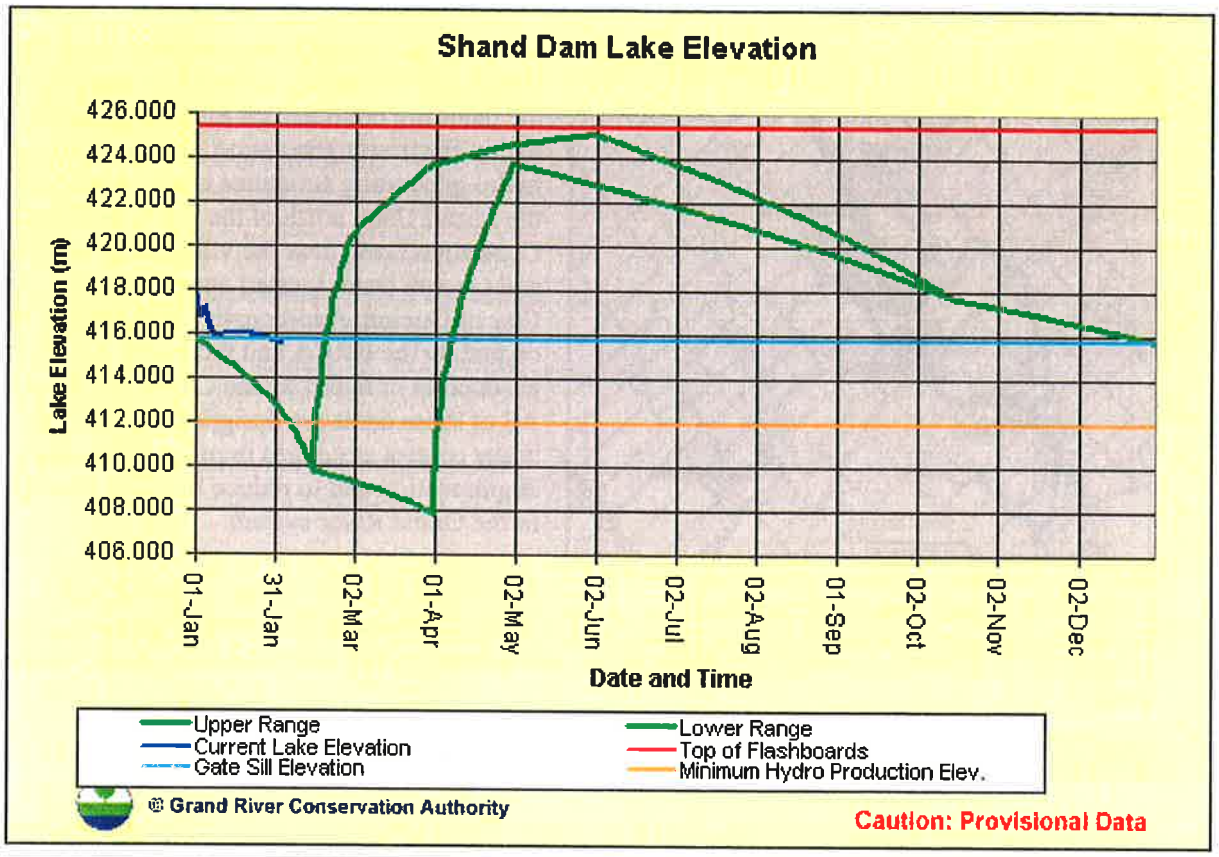

Figure 4. Shand Dam Operating Rule Curve

Dam and Hydropower Facility

The Shand Dam is an earth embankment dam with a concrete control structure. The control structure is composed of 4 gates, two-48 inch valves and one-66 inch valve. One of the 48 inch valves was retrofitted to accommodate the hydro turbine (Figure 5).

The hydro turbine has been sized to discharge the normal range of summer flows needed to meet downstream low flow requirements. Therefore, under normal operating conditions, discharge from Shand Dam is through the hydro turbine on a constant basis. If additional discharge is needed to meet downstream demands or to route inflows through Shand Dam, the other 48 inch valve and four main control gates are used to provide additional discharge capacity.

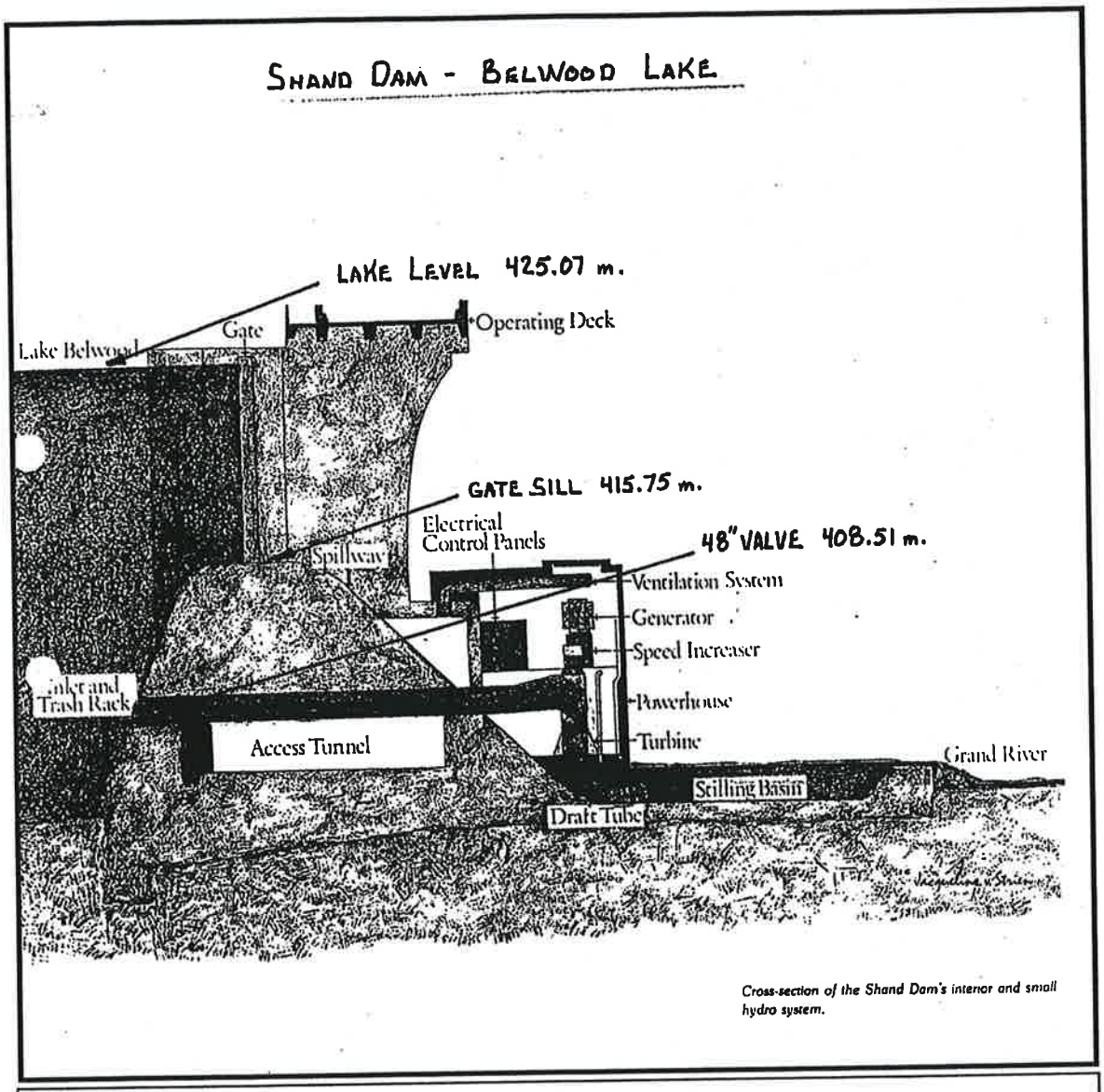

Figure 5. Shand Dam Cross Section

When the turbine was installed, an automatic valve operator was installed on the remaining 48 inch valve. This valve operator opens the 48 inch valve to a predetermined setting in the event of an unscheduled turbine shutdown. This ensures discharge is maintained downstream of Shand Dam in the event of a turbine shutdown.

Resource Values and Issues

Ecological and Environmental Values:

A tail-water fishery below the Shand Dam has been recognized as a "world-class" brown trout fishery. There is a committee that includes the MNR, GRCA and several other groups

that are in the process of completing a "Grand River Tail-water Fisheries Management Plan. The current operating regime of the Shand Dam is crucial in maintaining this fishery. There are also several species on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)'s species at risk list located downstream of Shand Dam. These species depend - at least partly - on flows from the Shand Dam. The black redhorse, silver shiner, green darter, and wavy lamp ray mussel have all been observed between 10 and 15 km downstream of the Shand Dam. This is well outside of the immediate zone of influence of the dam, but the dam does have some influence on water quality and quantity. It is suspected that low-flow augmentation and bottom draw discharge of cooler water benefit these species. The impacts of the Shand facilities on these species are related to the dam operations for low-flow augmentation and not to the hydro generating turbine located at the site.

It should also be noted that minimum low flows are maintained in the river system to assist in maintaining municipal water quality objectives.

Social Values:

The Shand Dam and reservoir provide flood protection and flow augmentation to downstream municipalities.

The Shand Reservoir or Belwood Lake supports over 300 cottages. The lake has a sport fishery that includes good populations of smallmouth bass, northern pike and perch. The lake is also popular with boaters and day users.

Economic Values:

The hydropower facility produces 600 kW of hydropower which is considered environmentally friendly or green power.

Issues:

In regards to possible conflicts with other users, including influence on fish or wildlife, it is noted that the discharge at all GRCA dams fitted with hydro power generators are not adjusted for hydro generation purposes. Discharges from all three dams are only adjusted to meet downstream low flow requirements, to reduce downstream flooding or to manage reservoir levels

Neither the water quantity nor quality is in any way affected by the operation of the hydro turbines. The amount of electricity generated varies with the quantity of water discharged through the turbine and the upstream reservoir level.

Oxygen levels in discharge water may be low or non-existent at these three dams during certain times of the year. The depth of water in these reservoirs causes stratification to occur in the reservoir. This causes the water at the bottom of the reservoirs to have little or no oxygen. The valves and turbines at these dams draw their water from near the bottom of the reservoir. Therefore, the discharge water may have very low oxygen levels, particularly in the mid to late summer period of the year. The oxygen levels return to normal a short distance downstream of the reservoir as discharge water flows over riffles that cause reaeration to occur.

At Shand Dam, the 48 inch valves discharged against a baffle that caused reaeration to occur. Once the turbine was installed, no reaeration occurred because discharge took place under water, not against a baffle. At Shand Dam, passive aeration of the discharge was incorporated into an updated stilling basin design that was installed in 1997. This compensates for the loss of aeration that existed prior to the turbine being installed. Monitoring of oxygen levels in the discharge water below Shand Dam has also been implemented.

Presently, there are no identifiable issues associated with the operation of the hydropower facility.

Current Operations

The current operation of the Shand dam follows a pattern of filling the reservoir during the spring runoff, flow augmentation during the summer low flow season, fall drawdown to winter levels and a repeat of the cycle the following spring. The seasonal Rule Curve is illustrated in Figure 4.

Hydro production was added to the dam well after the date of construction. The existing 48 inch valve was modified to accommodate a hydro turbine. The design of the hydro turbine was constrained by the physical infrastructure and the normal discharge patterns. The turbine was sized to the normal river discharge patterns. Turbine discharge, if adjusted, is based on downstream flow needs. The magnitude of these adjustments is small, typically less than 30% of the turbine capacity.

Provisions are in place to automatically supply flow if there is an unscheduled shutdown of the turbine. If the turbine shuts down, staff are deployed to the site to investigate. At this point discharge is supplemented by auxiliary means automatically (e.g. bypass valve opens or 48 inch valve is opened). Staff inspect the turbine a minimum of once per day to confirm normal operations and to check for any leaks or abnormal operating conditions.

The characteristics of all three GRCA dams are summarized in Tables 1 & 2.

Table 1. Flow Characteristics of GRCA Hydro Power Dams

Dam	Date Dam Began Operating	Date Hydro Was Implemented	Type of Hydro Turbine	Maximum Production (kw)
Shand	1942	1985	Vertical Propeller	600
Conestogo	1957	1991	Horizontal Propeller	500
Guelph	1976	1982	Horizontal Propeller	75

Table 2. Power Production and Turbine Type of GRCA Hydro Facilities.

Dam	Height of Dam (m)	Maximum Storage 1000's m^3	Range of Discharge		
			From Turbine (m^3/s)	From Dam (m^3/s)	Over Summer Months (m^3/s)
Shand	22.5	63,745	3 to 6	1.5 to 520	3.5 to 7
Conestogo	21.6	59,445	3 to 4	0.5 to 450	3 to 5
Guelph	19.9	20,529	0.8 to 1.1	0.5 to 60	0.9 to 1.2

Hydropower Facility Zone of Influence

Since the operation of the Shand Waterpower Facility does not regulate the upstream water levels and downstream flow, the zone of influence is immediately upstream and downstream of the hydro facility.

Current Operations Versus Plan Objectives

The Shand hydropower facility operates in accordance with the objectives established through previous planning and approval exercises and meets the objectives of the Water Management Plan. Should this dam be classified for a Class "A" WMP, it is not within the scope of the simplified water management planning process to ask for any change in the operating regime of adjacent structures that are not operated for the purposes of waterpower production. Only issues that are directly associated with the operation of the waterpower facility will be considered for mitigation within plan objectives.

Information Gaps, Priorities and Program

An adequate data collection method is in place to monitor the facility and provide adequate data for managers concerning water levels and discharges and dam operations.

Information on current flow rates, dissolved oxygen values and hydro production can be obtained from the GRCA web site at www.grandriver.ca. Historical data can be obtained by contacting the GRCA .

Monitoring of oxygen levels in the discharge water below Shand Dam has also been implemented.

Recommended Site Classification and Rationale

The Steering Committee recommends that the Shand Dam Hydropower Facility owned by the Grand River Conservation Authority be classified as a Category "A" Water Management Plan.

Category "A" facilities are those facilities that exert a small amount of control over water levels and flows and are without issues that can be mitigated through a change in the hydro facility operations.

Although the Shand Dam can exert significant control of upstream water levels and discharges, reservoir storage is not manipulated for hydropower production and there are no identifiable issues that could be mitigated through a change in the hydropower facility operations.

Appendix A

Terms of Reference
For Shand Dam Hydro-Electric Generating Station
Water Management Plan

October 2004

Approval Sheet

Subject: **Scoping Document**
Hydro-Electric Generating Station at Shand Dam
Water Management Plan

APPROVED: Original signed by _____ Date:
Cora Sheppard
Guelph District
Ministry of Natural Resources

Original signed by _____ Date:
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1.0 Introduction

The Grand River Conservation Authority (GRCA) owns and operates several dams and water control structures in the watershed. These include three dams that have hydro generating turbines incorporated into the structures. The Shand Dam above the Town of Fergus, Conestogo Dam near the village of Drayton and Guelph Dam, located upstream of the City of Guelph all have hydro turbines built into the structures. Additionally, Wilkes Dam is owned by the GRCA and facilitates the production of hydro by the City of Brantford. All of these facilities are designed primarily as water control structures to provide low flow augmentation and to reduce flooding damage in the Grand River system.

The Shand Dam is a multi-use water control structure. The primary objectives of are to reduce flood damage downstream, to provide low-flow augmentation during dry periods of the year and to ensure that there is adequate flow to dilute wastewater and provide a water source for the City of Brantford and Kitchener. Auxiliary benefits derived from these dams include recreation and hydro production

As part of the dam design, a hydro generating turbine has been fit into an existing water control valve. The Operations of the Shand Dam are guided by a Rule Curve that was initially developed as part of the 1982 Grand River Basin Water Management Study.

The current rule curve and operating policy for GRCA reservoirs dates back to 1978. On February 8, 1978, a committee made up of representatives from the Ministry of Natural Resource (MNR), the Ministry of the Environment (MOE) and the GRCA reviewed and recommended the present day general operating procedures and guidelines. These procedures and guidelines incorporated the recommendations of the 1974 Flood Inquiry.

In 1982, the rule curve and operating guidelines were reviewed and revised to implement the recommendations of the 1982 Grand River Basin Water Management Study (MOE). These revisions related to downstream low flow operating targets.

These low flow operating targets were established as part of the Grand River Basin Water Management Plan. They were established for water supply and pollution abatement purposes. During the summer and fall months the major dams are operated to meet downstream low flow targets.

The Shand Dam is an earth embankment dam with a concrete control structure. The control structure is composed of 4 gates, two-48 inch valves and one-66 inch valve. One of the 48 inch valves was retrofitted to accommodate the hydro turbine.

The hydro turbine has been sized to discharge the normal range of summer flows needed to meet downstream low flow requirements. Therefore, under normal operating conditions, discharge from Shand Dam is through the hydro turbine on a constant basis. If additional discharge is needed to meet downstream demands or to route inflows through Shand Dam, the other 48 inch valve and four main control gates are used to provide additional discharge capacity.

2.0 Goals and Principles

The Shand Dam Water Management Plan will be prepared to fulfill Section 23 (1.1) of the *Lakes and Rivers Improvement Act*. The Water Management Plan will follow a Simplified Planning Process and will be prepared in accordance with the goals and principles as outlined in Section 4.0 of the *Waterpower - Water Management Planning Guidelines for Waterpower* (2002).

3.0 Steering Committee Membership

The Steering Committee for the Shand Dam Generating Station Simplified Water Management Plan shall consist of:

Dwight Boyd	Grand River Conservation Authority
Cora Sheppard	Ministry of Natural Resources
George Booth	Ministry of Natural Resources

4.0 Roles and Responsibilities

The proponent for the preparation of the Shand Dam Generating Station Simplified Water Management Plan will be the GRCA. The GRCA will be responsible for undertaking the planning process in consultation with the MNR, as per the *Waterpower - Water Management Planning Guidelines for Waterpower* (2002). The responsibilities of the proponent in the water planning process are as follows:

- Coordinate and consult with MNR and other members of the Steering Committee throughout the process of the Simplified Water Management Plan;
- Assemble in co-operation with the MNR, environmental, hydrologic, engineering and socially related information from available sources and undertake a gap analysis to establish data collection needs;
- Apply historical flow, water level, climatic and operations data to establish a baseline model to be applied in the preparation of the Simplified Water Management Plan;
- Prepare a Simplified Water Management Plan Report documenting the planning process.

Schedule

Terms of Reference	2nd week January, 2004
Review of Range of Control over Flows and Levels (Categorization of the WMP)	mid January, 2004
Development of Schedule for Preparation of the WMP	1st week February, 2004

Final Scoping Document Preparation	1st week October, 2004
Approval of Scoping Document	2nd week October, 2004