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APPLYING FOR PERMITS TO TAKE WATER FROM SURFACE WATER SOURCES IN THE GREATER TORONTO AREA

Companion to the *Guide for applying for approval of Permit to Take Water*

Technical Support Section
Central Region
Ontario Ministry of the Environment

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1. INTRODUCTION

This document was prepared by Water Resources Staff of the Ministry of the Environment's Central Region in response to concerns about surface water takings in the Greater Toronto Area (GTA). The GTA comprises the City of Toronto and the surrounding Regional Municipalities of Halton, Peel, York, and Durham. In addition to providing water for a variety of extractive uses, surface waters of the GTA fulfill important in-stream uses such as assimilating wastes, providing recreation, and supporting aquatic life, including fish.

The GTA is experiencing rapid urban growth, and this rate of growth is expected to continue into the foreseeable future. Associated with this growth is a high demand for the development of new residential housing and recreational facilities such as golf courses. These developments, in turn, place significant demands on the water resources of the area. In light of the increasing water demands, there is concern that conflicts over water use may occur in the future. There is also concern that conflicts may be worsened by water shortages due to droughts, such as those that have occurred in recent years.

Balancing the increasing demands of human water users with one another and the aquatic ecosystem requires sound, basin-wide strategies for water allocation. However, it is recognized that, at present, such basin-wide strategies are not available for most of the surface waters of the area. As a first step, we have updated our approach to reviewing applications for Permit to Take Water from surface waters. The updated approach gives due consideration to the ecology and hydrology of the watercourse, and considers available information on other water users with the objectives of ensuring that:

- minimum in-stream flows required to protect aquatic life and habitat are maintained.
- unacceptable interference with other uses of the water does not occur.
- water is allocated fairly between users.
- water conservation practices are implemented.

This document is a companion to the Ministry's *Guide for applying for approval of Permit to Take Water*. It is intended to assist applicants requesting Permits to Take Water from surface waters by outlining the information that should be submitted to demonstrate that a proposed water taking meets the above objectives. Section 2 of the document outlines information requirements regarding site conditions, the ecology and hydrology of the water source and details of the proposed water taking. Section 3 provides a summary of methods that may be used to determine low flow characteristics and in-stream flow requirements, and suggests where to obtain available data. Section 4 specifies some of the special conditions of approval that will be part of most Permits to Take Water from surface water sources.

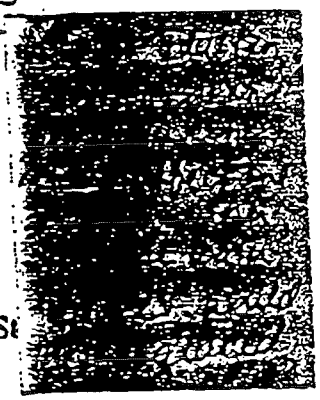
This document may be modified in future as new information regarding the ecology and hydrology of the Region's watersheds becomes available or as dictated by the water allocation needs of the Region.

ground & surface must be managed together with same policy - now everyone will go 'underground' to avoid this.

1.1 Surface Water Sources

The following are considered to be surface water sources:

- rivers, streams, creeks, brooks, whether flow is continuous or intermittent.
- on-stream ponds supplied by continuous or intermittent watercourses.
- natural or constructed ponds supplied by surface runoff.
- lakes.



1.2 Contact Information

Applicants are strongly encouraged to consult with Regional Water Resources St specific information requirements for a proposed water taking.

To obtain guidance with respect to applications or to provide comments on this document, please contact Regional Water Resources staff at the following address:

Director, Permit To Take Water Program
Ministry of the Environment, Central Region
Technical Support Section
5775 Yonge Street, 8th Floor
North York, Ontario M2M 4J1
Tel: (416) 326-6700 or 1-800-810-8048
Fax: (416) 325-6347

Note that this document deals only with surface water takings. Guidance with respect to applications to take water from ground water sources may also be obtained from Water Resources staff at the Regional Office.

2. INFORMATION REQUIREMENTS

When applying for a Permit to Take Water, the onus is on the applicant to demonstrate that the proposed water taking will not cause unacceptable ecological impacts and that it will not interfere with other water users. The following must be submitted in support of a proposed water taking:

- ***an Application for Permit to Take Water that is completed fully in accordance with the October 1994 document "Guide for applying for approval of Permit to Take Water".***
- ***a report that details the proposed water taking and that demonstrates satisfactorily that the proposed water taking will not result in unacceptable ecological impacts or interfere with other water users. It is recommended that applicants retain the services of a qualified consultant with specialization in aquatic ecology and hydrology to prepare the report.***

Specific information requirements are outlined in the following sections. Providing all of the required information along with a completed application form will speed the review process and result in a quicker response to applications. Applications that are incomplete will not be processed until all of the necessary information has been provided.

2.1 General Information Requirements

- provide background information regarding the purpose of water taking, history of water use at the site, previous studies, land use, site location, physiography and geo-hydrology, locations of hydro-meteorologic stations used in the assessment, etc.
- provide a location map showing property boundaries and other on-site features. Also, delineate the upstream catchment area on a topographic map of suitable scale.
- provide geographical coordinates of the water taking. These may be provided as either UTM coordinates or latitude/longitude. The source of information should be referenced (e.g. 1:10 000 map, global positioning system, etc.)
- in the case of proposed new takings, provide evidence that the subject land is designated and approved for the stated land use. It is our practice to not issue Permits to Take Water until land use planning approvals have been obtained. Any permits that are issued in advance of land use planning approval will be issued for a maximum duration of one year and will not be renewed until final land use plan approval has been obtained.

2.2 Information Related to the Source of Water Taking

For a river or stream:

- provide information regarding the ecology of the stream. It may be necessary to conduct field investigations to evaluate the aquatic environment (e.g. aquatic habitat, presence of fish and other aquatic life, identification of fish spawning areas, etc.). Applicants are encouraged to consult with those agencies responsible for fisheries management and fish habitat protection (e.g. Ministry of Natural Resources, Conservation Authority, Federal Department of Fisheries and Oceans).
- provide information regarding the hydrology of the stream. Historical flow records at a nearby stream gauging station or flow data collected at the site should be used to determine flow quantities such as the $7Q_{10}$ (7-day average minimum flow with a 10-year return period), the $7Q_{20}$, the mean flow and the median flow (flow with a 50% duration) for the site. Site specific conditions may require determining these quantities on a monthly basis. The methods used to determine these quantities for the site (such as regression, nearby station proration, etc.) should also be provided. Sources of flow data for a number of streams in the region are provided in Section 3.2.
- provide an estimate of the minimum in-stream (passing) flow that should be maintained at the site, based on flow requirements for the protection of aquatic life and maintenance of aquatic habitat. Examples of methods to determine in-stream flow requirements based on habitat needs are provided in Section 3.1.
- provide an assessment of existing water uses including an estimate of downstream water requirements to the extent possible. Also, identify other potentially-affected water users.

For a pond or lake:

- provide morphometric data for the pond/lake - i.e. surface area, volume, mean depth, maximum depth.
- identify the source(s) of water for the pond/lake - i.e. inlet stream(s), runoff, ground water. If the main source is an inflowing river or stream, provide information as required for a river or stream (see above). If the main source is runoff, provide a water budget for the catchment. If the main source is ground water, a hydrogeological report is required.
- describe the outlet - i.e. naturally or artificially controlled, plus description of design/structure and operation.
- identify downstream watercourses.
- identify other, potentially-affected water users, both upstream and downstream.
- for a constructed pond, indicate whether it is on-stream or off-stream. For on-stream ponds, provide evidence that the pond has been approved or otherwise accepted by the Ministry of Natural Resources and the Conservation Authority.

2.3 Information Related to the Proposed Water Taking

- provide details of estimated water requirements together with the area of land to be irrigated and the irrigation requirements of the particular turf or crop.
- based on in-stream flow requirements, available flow in the watercourse and the water requirements of the on-site operations, formulate operational rules (instantaneous rate of water taking, the total daily amount and pumping schedule, etc.) that will be used to control withdrawals from the stream. Demonstrate that water taking at the site under these rules meets downstream flow requirements for aquatic life and habitat needs plus the requirements of other existing downstream water users. The operational rules proposed by the applicant:

  i. Must include a minimum stream level (or flow amount) below which water taking directly from the stream should cease. The rationale for arriving at this figure should also be provided. Examples of thresholds for in-stream flow maintenance cited in the literature include:

  - *30% of mean annual flow (Tennant Method)*
  - *inflection point of the wetted perimeter vs. discharge curve (Wetted Perimeter Method)*
  - *the $7Q_{10}$*
  - *median daily flow during the summer months*

  ii. Should specify an appropriate rate of taking to ensure that sufficient water remains available above the in-stream requirement for utilization by downstream users.

  iii. May vary with season, depending on site specific conditions.

- a gauging station should be established permanently at a suitable location downstream of the proposed intake so that water taking at the site can be controlled by the water level. The use of structural or automated control systems is encouraged.
- provide details on water storage facilities, pump set-up, intake location etc. Storage ponds should be sufficiently sized and off-stream.
- demonstrate that water conservation measures are implemented. Examples are:

  - computerized irrigation systems with moisture sensors and efficient sprinklers.
  - re-use of on-site water (e.g. under-draining, collection of storm water).
  - use of low-maintenance, drought-resistant turf.
  - restricting irrigation to essential areas.
  - use of irrigation methods which minimize evaporative water loss.

- if the application is for renewal of an existing Permit to Take Water, the applicant should provide available records of water takings, stream water level (or flow) measurements, etc. The applicant should also provide a plan that specifies how water management will be improved at the site (e.g. by improving irrigation systems, providing storage ponds, setting a minimum stream level below which no taking would occur, etc.), along with a schedule for implementing the plan.

3. ANALYTICAL TECHNIQUES AND DATA SOURCES

3.1 Methods for Determining In-stream Flow Requirements

Several methods have been developed to estimate in-stream flow requirements based on habitat needs. One group features the identification of a minimum flow standard required to protect habitat needs or other in-stream uses. The methods in this group can be "non-field methods" or "habitat retention methods"[1]. Non field methods involve the determination of in-stream flow requirements based on historic flow records rather than on-site field data. An example is the Montana or Tennant method[1,2,3]. The Tennant method mainly requires the determination of flow statistics, such as the annual mean flow. The method recommends maintaining 10% of the annual mean flow as the minimum short-term flow requirement to preserve fish habitat, while 30% is considered the minimum on a long-term basis.

Habitat retention methods also define minimum flow standards, but require measuring hydraulic variables such as water depth, flow velocity, wetted perimeter and substrate to examine relationships between stream discharge and indices of fish habitat. The measured hydraulic variables are compared to known habitat requirements of fish species to determine the minimum acceptable in-stream flow. Examples are the Idaho method[2] which relates, for example, water level versus discharge curves to known biological criteria, and the Wetted Perimeter Method[1,2] that recommends in-stream flows based on the wetted perimeter versus discharge curve.

A second group of methods is the "Incremental Methodologies", such as the In-stream Flow Incremental Method (IFIM)[1,2,4]. IFIM is a habitat simulation method that involves the collection of hydraulic data together with habitat preferences of a given species. It uses computer models to indicate habitat availability for the species as a result of increases or decreases in stream flow.

The need to determine in-stream flow requirements for habitat preservation (or other in-stream uses) and the level of detail and sophistication of analysis will vary depending on specific conditions of the site. It is recommended that site specific field data be collected and used to the extent possible to verify data determined solely from historical records.

3.2 Stream Flow Data

Daily stream flow data for a large number of monitoring stations are available in electronic format from Environment Canada. These can be used to determine low flows at a site using appropriate statistical methods. Additional flow data may also be available from Conservation Authorities.

Low flow characteristics for a number of the gauging stations have also been provided in a report by Cumming Cockburn Limited (CCL) entitled "Low Flow Characteristics in Ontario, June 1989". A second report by CCL, "Regional Analysis of Low Flow Characteristics, August 1995" provides information on techniques used to transfer flow data from gauged stations to un-gauged sites. The two reports are available at the Ministry's Laboratory Library located at 125 Resources Road, Etobicoke. Those wishing to make copies of relevant sections of the reports should first make appointments by calling library staff at (416) 235-5751 between 8:00 am and 4:00 pm Monday to Friday.

4. SPECIAL CONDITIONS OF PERMITS TO TAKE WATER

In addition to the General Conditions which are common to all Permits to Take Water, most Permits will also contain a number of Special Conditions that are specific to the particular water taking. Typically, these Special Conditions will require some or all of the following:

- keeping records of the duration, rate, and volume of water taking.
- monitoring stream flows, pond storage levels, or lake levels.
- submission of plans and schedules for improving on-site water management.
- submission of monitoring reports.

An expiry date is specified on most Permits. The duration of Permits will vary depending, in part, on the level of concern associated with the water taking. In some cases, short-term renewals of existing Permits may be granted to allow a Permit Holder sufficient time to prepare a plan for improving on-site water management and water-taking practices.

References

1. Colorado Water Conservation Board, "Evaluation of the Standards and Methods Used for Quantifying Instream Flows in Colorado, November 1998": *prepared by Gregory D. Espergen, Colorado Water Conservation Board.*

2. David R. Maidment (editor), "Handbook of Hydrology", McGraw-Hill Inc, Toronto 1992. (*Chapter 27: Hydrologic Design for Water Use by T.A. McMahon*).

3. Donald L. Tennant, "Instream Flow Regimes for Fish, Wildlife, Recreation and Related Environmental Resources": *Fisheries, volume 1, No.4: 6-10.*

4. US Department of the Interior, Fish and Wildlife Service, " Development and Evaluation of Habitat Suitability Criteria for Use in the Instream Flow Incremental Methodology, September 1986" (Instream Flow Information Paper No. 21): *prepared by Ken D. Bovee.*

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