

Drinking Water Management in Ontario: A Brief History

“It has been said that the study of our past is perhaps the best way to anticipate the future.”
- T.D. Fahlenbock, Pollution Control Association of Ontario (1985)

The Ontario Sewer and Watermain Construction Association (OSWCA) represents over 700 companies that supply, build, and install the vast underground network of pipes that bring clean water to the residents of Ontario. With its origins dating back to the mid-1950's, the OSWCA was one of the first provincial organizations concerned with the safe and secure delivery of potable water to the public, a concern that is front and centre for the Association to this day.

The purpose of this paper is to help the Walkerton Inquiry Panel and members of the public understand and appreciate the complexities of managing and financing water infrastructure. The paper contains descriptions of the major historical events affecting drinking water management and their impacts, focusing on key social, political, economic and other factors. The Association believes that what has happened in the past can lead to the identification of policies and practices that could prevent another Walkerton tragedy.

In the Beginning

The first piped water supply in Ontario was established in Toronto in 1837 as a private operation¹; the water was drawn from Lake Ontario and delivered to customers untreated. From there, development of Ontario's communal water supplies developed on an ad hoc basis primarily driven by population growth and the need to combat fire. Water systems at the time were either owned and operated by private citizens, or, after passage of the *Baldwin Act (Municipal Act)* in 1849, by municipalities.

The *Municipal Waterworks Act* was introduced in 1882 to facilitate creation of municipal water utilities. The Act provided the provincial government with a mechanism to promote infrastructure spending without increasing the province's own debt². Instead, the debt was borne by municipalities, which in turn relied on municipal taxes to cover costs. Although the *Municipal Waterworks Act* facilitated creation of municipal water systems, municipalities were not compelled by law to provide water and usually deferred action until forced by disaster³. Two cases in point were Kingston in 1849 and Hamilton in 1854, both of which undertook improvements to existing water systems following an outbreak of cholera and a rash of fires, respectively.

At about the same time that Kingston and Hamilton were upgrading their water systems, doctors and scientists were beginning to suspect water as a carrier of diseases such as typhoid fever, and as a main cause of infant mortality. Recognizing the significant role of water quality on human health, the provincial government passed the *Public Health Act* in 1884, to be administered by the Provincial Board of Health. The Board was responsible for ensuring the safety of drinking water and used the *Public Health Act* as the primary legislation to deal with matters related to drinking water, as well as sewage works, septic systems, and disposal of contaminants into the province's watercourses⁴.

The prevailing attitude at the time was that dilution was the solution to pollution. For example, most municipalities along the Great Lakes and its major tributaries discharged untreated sewage directly into local watercourses. These same municipalities often had their drinking water intake near their (untreated) sewage outfall pipes. In Sarnia, for example, the drinking water intake pipe was only 45 metres away from the outfall sewer⁵.

The first major study by the International Joint Commission (IJC), an independent joint panel of U.S. and Canadian researchers and scientists, declared that water taken from the Great Lakes was unsafe to drink⁶. The study, which was completed in 1912, used coliform bacteria as an indicator of pollution, and also found that water treatment prior to delivery to the consumer was minimal. The study results were corroborated by the incidence of typhoid fever, which was highest in municipalities along the Great Lakes⁷, in comparison to the average rate for the rest of Ontario. Based on the study findings, the IJC recommended daily bacteriological examinations of drinking water, the treatment of all drinking water, and the installation of proper sewage.

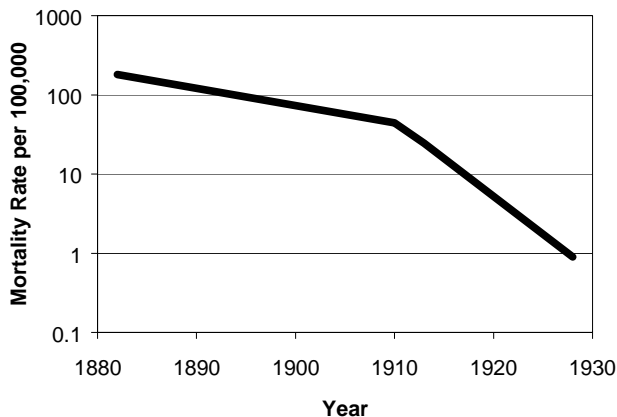


Figure 1. Annual mortality rates per 100,000 attributed to typhoid fever.

Chlorination as an effective method of killing harmful bacteria was first recognized in the early 1900's. In Toronto, chlorination of the water supply began in 1910, and in the period from 1910 to 1928, the number of typhoid fever deaths per 100,000 population dropped from 44.2 to 0.9⁸, as shown in Figure 1. According to the Department of Health of the City of Toronto, in 1928 the average "citizen now accepts his safe water...without much thought as to how it came to be safe or what efforts are required to keep it so"⁸.

Throughout this time period and into the 1950's, the provincial government sought to improve the quality of all drinking water by requiring municipalities to seek approval for water supply and sewage treatment systems from the Provincial Board of Health which had the authority to issue 'mandatory orders' to compel municipalities to chlorinate, or install water filtration plants. Such 'mandatory orders' were often strenuously opposed by municipalities; in one instance, the entire council chose to resign rather than comply with the order⁹.

Changes were made to the *Municipal Act* in 1943 to allow municipalities to finance waterworks projects by a user rate, instead of relying solely on taxes¹⁰. However, during the depression years and into the post-World War II era, few municipalities had the resources, or were willing to use them, to construct new, or maintain existing, water systems. The Ontario population continued to grow during this time with the result that water systems became increasingly out-dated and overloaded¹¹.

Creation: Ontario Water Resources Commission

By the 1950's, Ontario was facing a imminent crisis. First, the IJC revealed an almost four-fold increase in bacteria levels in the Great Lakes since their earlier study of 1912¹¹. The increased bacteria levels were attributed to increased growth and industrial development and exacerbated by inadequate sewage treatment and disposal. Second, municipalities were facing lawsuits seeking to ban discharge of inadequately treated sewage¹². In response to these pending crises, the provincial government took action.

First, the provincial government amended the *Public Health Act*, removing the right of private citizens to sue for harm and nuisance caused by sewage treatment operations¹². Next, the provincial government passed legislation, titled the *Ontario Water Resources Commission Act*, intended to accelerate the restoration of polluted waters, through, in part, the construction of sewage treatment and water supply plants¹².

This paved the way for the creation of the Ontario Water Resources Commission (OWRC), an agency that was the first of its kind in the world¹³ and one that would become world-renowned as a leading authority in the field of water management¹⁴. The year was 1956.

The concept of the Ontario Water Resources Commission emerged when talk centred around the need for comprehensive water resources management¹⁵. The OWRC was created as an independent body, reporting to the Department of Health. Comprised of sanitary engineers, the OWRC was given complete oversight of Ontario's water resources, including water treatment and supply. Specifically, the Commission's mandate was to (1) finance, build and operate water treatment and sewage disposal systems; and, (2) supervise and control the use of the province's water resources¹⁶. In order to carry out its mandate, the provincial government vested the Commission with powers to approve all waterworks prior to construction, to inspect facilities during operation, and to levy fines for pollution.

Financing, Building and Operating Waterworks

Over the fifteen years of its existence, the OWRC's most significant activities were financing and building water treatment, water distribution, sewage collection and sewage disposal facilities¹⁷. The program of water and sewage works construction and operation was unique among environmental agencies throughout the world¹⁸.

In Ontario, delivery of potable water has historically been, and continues to be, the responsibility of municipalities. Various provincial legislation, including the *Public Utilities Act*, the *Ontario Water Resources Act*, the *Municipal Act*, the *Ontario Municipal Board Act*, and the *Local Improvement Act*, gives municipalities the power and responsibility to finance, build, own, and operate water works.

Prior to the creation of the OWRC, municipalities had two ways of financing waterworks projects: (1) by using local revenue sources, such as property taxes; and/or, (2) by borrowing the funds, which required the municipality to issue debentures. Creation of the OWRC presented municipalities with additional options; specifically, the OWRC could be called upon to build facilities on behalf of municipalities; and/or, to provide financial and technical assistance so that municipalities could build their own facilities. Specifically, municipalities could:

- Negotiate a loan agreement with the OWRC, whereby the municipality could assume ownership of the works after debt repayment. Under such a scenario, the municipality did not have to issue debentures¹⁹, and the OWRC provided attractive loan provisions, such as longer repayment terms. With a provincial debt guarantee, infrastructure projects could be financed for 30 years, or as much as 40 years, rather than the 20 years normally afforded to municipalities.
- Enter into an agreement whereby the OWRC would design, construct, finance, operate and own the waterworks, on behalf of the municipality. Operation of the waterworks facility was provided by the OWRC for the lifetime of the debt, and, upon full repayment of the debt, either party could request that ownership of the works be turned over to the municipality. The OWRC eventually introduced a modified type of agreement, termed "provincial projects". Under this type of agreement, a service rate per thousand gallons was charged for services provided and was typically based on expected flows over a twenty year period including anticipated operating and capital expenditures. Most of these projects operated in a deficit position during the initial years when population and flowrates were smaller. Municipal councils, which chose to have the OWRC operate their facilities, were left only with the task of approving annual budgets for maintenance and repairs.

Municipalities generally financed loan repayments for waterworks projects through either a portion of the general property tax, a flat water rate to users, or a surcharge. The repayment generally consisted of a blend of interest and principal, and usually also covered operations and routine maintenance costs.

In the late 1960's, the provincial government initiated another form of financial assistance. In an effort to provide greater financial assistance to smaller communities, the provincial government, through the OWRC, started a series of unconditional subsidies aimed specifically at alleviating the cost of providing water and sewage facilities, both above- and below-ground.

Over the years, the provincial government has provided hundreds of millions of dollars to municipalities for the purpose of planning, designing and building water and sewage facilities through a variety of unconditional subsidy programs, including Direct Grants, 1974-1992, Lifelines 1987-92; jobsOntario, 1993; Municipal Assistance Program, 1993-97; and most recently, the Provincial Water Protection Fund, 1997-2000. Of these programs, the Direct Grants program was probably the largest, providing grants of up to 85 percent of the total capital cost of a waterworks project depending on the size of the population served; these expenditures and the OWRC's role in administering Direct Grants constituted a major ongoing infrastructure program of the provincial government.

In addition, the Ministry of Municipal Affairs indirectly provided municipalities with (1) unconditional grants to alleviate the higher cost per household of servicing sparsely populated municipalities and/or (2) a resource equalization grant, paid to "lower-tier" municipalities with below-average assessment bases to allow them to improve municipal services without incurring excessive property taxes. And, the Ministry of Northern Development and Mines provided additional funds on top of "up-front" grants for the construction of water and sewage services in Northern Ontario municipalities.

Supervising and Controlling Water Resources

The second component of the OWRC's mandate was to supervise and control the use of Ontario's water resources. Supervising water resources was accomplished through a number of activities, including:

- Inspections at water and sewage treatment facilities.
Prior to 1957, the Department of Health conducted infrequent inspections at Ontario water and sewage facilities. With the creation of the OWRC, there began an annual program of random but regular field inspections. The focus was on prevention, with OWRC staff providing considerable technical assistance to operators²⁰. As well as examining facility operation, the inspections provided the OWRC the opportunity to establish an inventory of above-ground waterworks, with information about capacity, treatment processes, and raw and treated water quality.
- Water testing and laboratory analysis.
A necessary part of ensuring adequate treatment at water treatment facilities relied on measuring the quality of the raw water and the finished product. Identifying and counting algae and determining dissolved oxygen concentrations were two of the tests conducted on raw water samples, while chlorine concentrations were of primary concern to

ensure drinking water samples remained bacteria-free. Through a series of technical bulletins²¹ and inter-office memoranda²², the OWRC specified testing procedures for a variety of water constituents. As the number of water treatment facilities grew and demand for the number and types of tests increased, the OWRC responded by expanding its laboratory services, one of the actions which is credited with contributing to the OWRC's international renown²³.

- Training and certification of operators and water and sewage works personnel. The OWRC developed a series of graded courses in water and sewage treatment in 1960, which were later followed by water and sewage operator courses. Basic, intermediate and senior courses were offered and those who passed a written examination received a Certificate of Qualification. The authors of the course materials and the instructors included staff from the various OWRC Divisions, municipalities, consulting engineering firms and associated industries²⁴.

Control of water resources was undertaken by the provincial government directly as well as through the OWRC. In the 1960's the Ontario economy was expanding rapidly and development was proceeding on an ad hoc basis. The provincial government became actively involved in guiding land use planning by promoting "regionalization" of local governments as a way to overcome the fragmentation caused by suburban growth²⁵. Shared services were thought to facilitate a more cohesive and consistent approach to development. In a number of instances hard services, such as infrastructure, including water treatment plants, reservoirs, and large-scale water transmission lines, within a given area were consolidated under the jurisdiction of so-called upper tier or regional municipalities. Local municipalities within these areas were left to focus on community issues such as garbage collection.

In addition to promoting regionalization, the provincial government, through the OWRC, directly participated in the development of water and sewage systems, many of which served multiple municipalities. With the OWRC's extensive powers to make orders regulating both industrial and municipal waterworks and sewage treatment facilities, and its right to expropriate for construction purposes, the next decade saw an increase in the number of shared and individual water systems, standardized water delivery, and improved water quality. Waterworks projects that were built during this period reinforced the OWRC mandate of water resources planning, and included:

- Union Water System. To ensure potable water to communities, while at the same time promoting industrial development, the OWRC signed agreements in southwestern Ontario with the municipalities of Essex, Gosfield North, Gosfield South, Leamington, Kingsville, Rochester and Sandwich South, Maidstone and Mersea and the H.J. Heinz Company to construct and operate facilities for joint use.

- **Lake Huron Water Supply System.**
Originally intended to supply only the City of London, economies of scale were achieved by hooking up communities along the line, including the town of Parkhill, villages of Ailsa Craig, Lucan, Grand Bend and Thedford, and the townships of East Williams, West Williams, McGilvray, Bosanquet, Hay, Stephen, Stanley and London.
- **South Peel Water and Sewage Systems.**
To promote land-use planning and development the provincial government negotiated an agreement serving five municipalities in the region of Peel. This system has grown to be one of the largest in Canada, serving over 750,000 people, and operated and maintained by almost 200 staff.

In addition to the examples listed above, the OWRC helped to construct and/or operate more than 12 other large "regional" water and sewage works serving multiple municipalities throughout Ontario from East Lambton, through Thornbury, to Haldimand-Norfolk, Quinte and the lower Ottawa Valley. The "regional" systems, also referred to as "area schemes", were in addition to the work done by OWRC in designing, approving, constructing and operating numerous individual systems for small communities with population under 7,500.

By 1972, there were 455 public water supply systems operating in Ontario, 70 of which were operated by the province through the OWRC²⁶.

Evolution: Ontario Ministry of the Environment

Between 1971 and 1974 the provincial government underwent a series of re-structurings, one of the most important of which resulted in the creation of the Ministry of the Environment (MOE)²⁷, formed through the amalgamation of the OWRC with the Air and Waste Management and Pesticides Control Sections from the Department of Health, among others.

The MOE was created to expand the work of the OWRC to encompass protection of the broader environment, not just water resources. At the same time, creation of the MOE allowed the provincial government to exercise greater influence over the activities of the commission. The evolution from OWRC to MOE continued the cycle of expanding mandates to cope with increasing demands originally begun by the provincial government when it initiated the Public Health Board, which was transformed into the Department of Health, and from thence the OWRC.

The *Ontario Water Resources Commission Act* was renamed the *Ontario Water Resources Act* in 1972, and language was added to the legislation to permit the "promulgation of regulations specifying standards of quality for potable and other water supplies, industrial and sewage effluent, and ambient water quality in receiving water bodies"²⁸. The Act went on to specify that the Minister could make regulations classifying, requiring, and prescribing the qualifications of persons to whom licences for water operators could be issued, suspended or revoked.

The MOE expanded the training program originally developed by the OWRC, and established a Training and Licensing Section (later changed to Certification Section) responsible for ensuring operator qualification.

In April 1974, the MOE reorganized with two basic objectives: one was to facilitate environmental policy making; and, the other was to transfer the “delivery” of programs from Toronto to local communities throughout the Province, bringing service and supervision functions closer to the people most affected. The Ministry's field operations were divided into geographic regions and regional offices were established in Kingston, Toronto, Hamilton, Thunder Bay, London and Sudbury, serving the Southeastern, Central, West Central, North-western, Southwestern and Northeastern areas of the province, respectively. In addition, a number of District offices were opened, to bring delivery of services even closer to the end users²⁹. Thus, policy making, financing, and administrative functions remained centralized, while operations and technical services of the former OWRC moved out to the Regional and District offices.

The MOE continued with the financing, design and construction programs initiated by the OWRC. The MOE's annual budget for water supply projects grew from \$26 million in 1972/73 to \$50 million in 1978/79³⁰. From 1956 to the end of the 1982/83 fiscal year, a total of \$2.043 billion was spent by federal, provincial and municipal agencies, according to Statistics Canada figures, supplying 98 per cent of the urban population with potable water³⁰.

After 1982, the MOE's annual expenditure to assist municipalities for *new* waterworks to accommodate population expansion began to decline, principally because: (1) water systems were well established in all major municipalities and most smaller municipalities³⁰; (2) the cost to construct new infrastructure was rising dramatically; and (3) municipalities were increasingly looking to developers to shoulder the costs for new services.

The Province began to reduce its capital expenditures by replacing direct grants with a system of loan-based financing. By the mid-1980's, however, the provincial government became increasingly concerned about the ability of municipalities to deal with the rising cost of infrastructure improvement. So, in 1987, the Ministry introduced *Lifelines*, a grant program intended to develop cost effective methods for rehabilitating existing water and sewage systems. As was done in the past, smaller municipalities received relatively more financial assistance, and those with populations less than 1,000 received as much as 85% of the total cost of infrastructure improvement. This program was phased out after five years, replaced by other financial assistance programs, including *jobsOntario*, the *Municipal Assistance Program*, and most recently, the *Provincial Water Protection Fund*. While the emphasis of each program has been different, the goal of each has been the same: to provide capital funds for water and sewage infrastructure.

By the late 1980's, there was talk of creating a self-financing, “super” agency to administer loans, seek out innovative financing with private partners, and provide comprehensive province-wide planning on a watershed basis to achieve effective municipal servicing.

In the provincial budget of April 24, 1990, the Treasurer of Ontario announced that a new water and sewer corporation was to be established which would report to the Ministry of Municipal Affairs, allowing the provincial government a greater role in municipal planning in respect of water and sewage infrastructure, while leaving responsibility for setting and enforcing environmental standards with the MOE. This division of responsibilities would alleviate allegations of conflict of interest against the MOE for its multiple roles of financier, owner, operator and regulator of (in some cases the same) water and sewage facilities.

Reinvention: Ontario Clean Water Agency

The "super" agency never materialized. In the fall of 1990, there was a change of government. Under the new administration, the provincial government tried to minimize its perceived conflict-of-interest position by divesting the operations and maintenance, construction, and financing arm of the MOE to a separate body and in November, 1993, the Ontario Clean Water Agency (OCWA) was formed.

At the time of start-up, OCWA was involved in four areas: (1) ownership of single facilities and area schemes; (2) contract services providing operation and maintenance services, and, to a lesser extent, project management services; (3) administration of loans for water and sewage facilities; and, (4) administration of provincial water/wastewater grant programs (primarily the Municipal Assistance Program (MAP)). OCWA, as a crown agency, reports to the provincial government through the Ministry of the Environment.

According to the *Capital Investment Plan Act (CIPA)*, OCWA's original mandate involved (1) assisting municipalities and the Province to provide water and sewage works and services on a cost recovery basis by financing, planning, developing, building, and operating such works and services; and, (2) providing these works and services so as to protect human health and the environment, encourage conservation of water resources and support provincial policies for land use and settlement. OCWA's mandate is virtually identical to the original mandate of the OWRC, and in fact, OWRC functions related to waterworks operation and financing were transferred to OCWA at the time of its creation.

The areas in which OCWA is involved have changed since the Agency was first created. In May of 1996, the Province transferred administration of provincial water/wastewater grant programs to the Ministry of the Environment, including all staff involved in administration. As a result, OCWA no longer provides grant administration services. Further, the Province passed legislation, titled the *Water and Sewage Services Improvement Act, 1997*, to facilitate transfer of legal title to water and sewage works from the Province (held on behalf of the Province by OCWA) to municipalities. Passage of the Act has, in essence, eliminated OCWA's (and hence the province's) ownership role.

As part of a government-wide review to examine alternative service delivery, OCWA was identified as a potential privatization candidate in 1998 when it was referred to the Ontario Office of Privatization. As of this date, no action has been taken with respect to the agency.

OCWA is today primarily a contract services company, providing operations and maintenance (O&M) of water and sewage works to clients, mostly municipalities. OCWA remains Ontario's largest crown agency, and is Canada's largest water and sewage operations and maintenance service provider, operating 60% of Ontario's sewage treatment plants and 20% of Ontario's water treatment facilities³¹.

In May, 2000, the Province directed OCWA to assume operations of the municipally-operated Walkerton water supply system.

Time for Rejuvenation

Over the past fifty years, great strides have been made in the management of drinking water in Ontario. In 1995, Ontario's water and sewage infrastructure was estimated to be worth \$50 billion, \$35 billion of which is comprised primarily of the vast underground network of water distribution and sewage collection pipes³².

Despite the efforts of the various provincial agencies, many water and sewage treatment plants, and the associated underground distribution and collection systems, are now in dire need of repair. Old water service pipes are deteriorating, with the result that noxious substances are being released into municipal drinking water supplies. According to the MOE's own 1995 Needs Study, the capital required for *rehabilitation alone* of Ontario's existing water and sewage treatment infrastructure alone amounts to over \$3 billion over the next fifteen years, and this amount does not include measures to fix combined sewers that pollute rivers and lakes in many older communities; costs that may arise from new regulations; the cost of water metering; or stormwater management costs³³.

Deferral appears to be a water management strategy that many municipalities are adopting. The trend is borne out by examining annual municipal per household spending for both water and sewage infrastructure, which has essentially remained the same for the last ten years (about \$210/household), as shown in Figure 2.

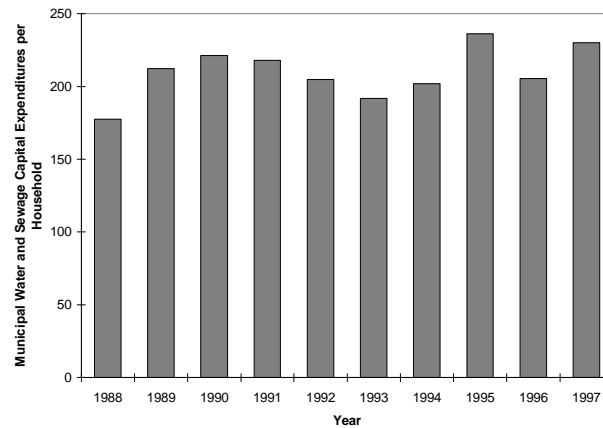


Figure 2. Ontario municipal capital expenditures on water and sewage infrastructure per household over the last 10 years.³⁴

An outcome of years of provincial financial assistance for water systems is that municipalities were relieved from paying the full costs of water and sewage infrastructure. In many cases, municipalities passed on the provincial subsidies to consumers in the form of low water rates³⁵. The unintended impact of years of low rates has meant that municipal attempts to raise water rates to cover the costs of infrastructure rehabilitation is sometimes met with local opposition. On the other hand, community groups have taken to the courts. The Water Advocacy Group (WAG), a local citizen's group, filed a \$30 million class-action law suit against their municipality over rust coloured water from aging pipes and alleged contamination due to coliform bacteria³⁶.

The potential for undesirable and unhealthy consequences has increased. An inspection blitz, ordered by the MOE following the Walkerton tragedy, found deficiencies in over half (357) of the province's 645 water treatment facilities. The four most common water treatment plant deficiencies were: (1) insufficient bacteriological or chemical testing; (2) inadequate maintenance of disinfection equipment; (3) non-compliance with minimal treatment guidelines; and (4) inadequate operator training.³⁷ No such inspection has yet been done on underground infrastructure (water supply and sewage collection pipes), but the findings would likely demonstrate a higher level of deficiency due to the inherently invisible nature of this infrastructure.

All this at a time when the International Joint Commission (IJC) has issued a warning that water levels in the Great Lakes are decreasing and municipalities should pay close attention to drinking water quality and potential problems from pollution caused by sewage discharged into areas where water is low³⁸.

Current circumstances ~ out-dated water and sewage infrastructure, IJC warnings about water quality, and municipalities facing lawsuits ~ are eerily reminiscent of the events of fifty years ago.

While health concerns are quietly making bottled water one of the leading growth industries, our drinking water quality appears to be eroding as fast as the flow in the pipes in which water is carried. The events of the Walkerton tragedy have forced us to focus on the fragility of municipal water systems and how these systems are managed. Hopefully this will lead us to conclude that water is not an infinite resource and responsible stewardship is necessary to ensure that Ontario's waters will be fishable, swimmable, and drinkable now and for the future.

If the study of our past is the best way to anticipate the future, then without appropriate action, confidence in our drinking water systems is in serious jeopardy of going down the drain.

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