A Paper On The Regulatory Approaches To Drinking Water Used In Canada And, Selectively, Abroad

Prepared For Public Inquiry Into The E.Coli Contamination Of The Water Supply In Walkerton, Ontario, And Into The Safety Of Ontario's Drinking Water, Established, By The Government Of Ontario Under The *Public Inquiries Act*.

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I. INTRODUCTION

A. Genesis of Paper

This research has been funded by the Public Inquiry into the E.Coli Contamination of the Water Supply in Walkerton, Ontario (the "Walkerton Inquiry"). This paper incorporates and builds upon research previously conducted by Sierra Legal Defence Fund and publicly released in January 2001.[1]

B. Goal of Paper

The goal of this paper is to analyse and compare legal and regulatory options for protecting and ensuring the safety of drinking water used in North America and selected international jurisdictions. This comparison provides context for assessing the adequacy of Ontario's drinking water legislation and serves as a basis for making recommendations regarding Ontario's laws and regulations.

This paper briefly addresses types of contamination commonly found in drinking water and activities that lead to drinking water contamination. This discussion is not intended as a comprehensive analysis of these issues but is instead intended to provide the reader with a basis for understanding threats that drinking water legislation and regulation must be designed to address. Anyone seeking a more thorough understanding of these issues should consult other sources including materials produced by Health Canada, the United States Environmental Protection Agency (EPA) or several of the other papers produced for the Walkerton Inquiry.

C. Methodology

Our analysis is based on both interviews with government officials and a review of the legislation in each jurisdiction. Initially, we telephoned government officials in the relevant ministries. A thorough review of legislation, regulations and polices followed. Provincial and territorial summaries were subsequently prepared and sent back to each jurisdiction for comment. Five of these

[1] Sierra Legal Defence Fund. January 2001. *Waterproof: Canada's drinking water report card*. [online] [Cited June 28, 2001] <http://www.sierralegal.org/clear/SierraRprt7.pdf> [hereinafter *Waterproof*].

– British Columbia, Saskatchewan, Ontario, Prince Edward Island and Quebec – chose not to respond.

The relevant government officials were asked about aspects of drinking water protection including:

- whether legal mechanisms exist to protect drinking water sources (both groundwater and surface water) from contamination;
- whether the province or territory had a single agency dedicated to protecting all aspects of drinking water quality;
- what they tested for and how that compared to the *Guidelines for Canadian Drinking Water Quality*.
- whether or not they used accredited labs to test water quality;
- whether requirements for water treatment were in place;
- whether water system operators had to be trained or certified;
- whether public reporting requirements have been adopted; and
- what regulatory oversight and correction powers exist.

Part II of this paper identifies the types of contamination commonly found in drinking water and activities that can increase risk of contamination. Part III introduces the "multi-barrier approach" to drinking water protection, which utilizes multiple defences to ensure drinking water safety. Part IV presents the findings of our research. Part V lists recommendations for legislative reform for drinking protection.

II. THREATS TO DRINKING WATER

According to the EPA, threats to drinking water quality and quantity are increasing. In *Water on Tap,* it states:

> Microbiological and chemical contaminants can enter water supplies. These materials can be the result of human activity or can be found in nature. For instance, chemicals can migrate from disposal sites and contaminate sources of drinking water. Animal wastes and pesticides may be carried to lakes and streams by rainfall runoff or snow melt. Human wastes may be discharged to receiving waters that ultimately

> flow to water bodies used for drinking water. Coliform bacteria from human and animal wastes may be found in drinking water if the water is not properly treated or disinfected. These bacteria are used as indicators that other harmful organisms may be in the water.[2]

As discussed in the Part IV of this paper, addressing the increasing threats to drinking water protection requires measures that are aimed, primarily, at the following goals:

- preventing contamination of water sources that supply drinking water.
- identifying the contaminants that may be found in drinking water and establishing limits on how much, if any, of the contaminant may be allowed in drinking water;
- establishing testing programs and protocols to determine if contaminants are present in drinking water;
- requiring water suppliers to install water treatment sufficient to remove contaminants that may be found in the drinking water supply;
- training water system personnel in the operation of the water system and recognizing threats to water quality;
- requiring prompt public notification of drinking water contamination and periodic notification of drinking water quality; and
- ensuring regulatory officials have adequate tools to oversee drinking water providers.

Designing a regulatory system capable of meeting these goals requires an understanding of the threats to drinking water, which include the contaminants that may be found in drinking water and activities that may lead to the presence of contaminants in drinking water.

A. Drinking Water Contaminants

The types of contaminants commonly found in drinking water include microbiological, chemical and radiological contamination.

[2] Environmental Protection Agency. July 1997. *Water on Tap*. [online] [Cited June 28, 2001] <http://www.epa.gov/safewater/wot/wot.html> [hereinafter *Water on Tap*].

1. Microbiological contamination

Pathogenic or disease-causing micro-organisms that contaminate drinking water include protozoa (single-cell parasites) such as *cryptosporidium*, bacteria and intestinal viruses. Each type of micro-organism may be present in surface water and groundwater, although protozoa are more commonly found in surface water supplies such as lakes, rivers and streams. Microbiological threats include cryptosporidium, giardia, and *E. Coli*.

Cryptosporidium is a parasite that enters lakes and rivers through human sewage and animal waste. It causes cryptosporidiosis, a gastrointestinal disease. However, the disease can be severe or fatal for people with weakened immune systems. Cryptosporidium was the cause of the worst modern-day waterborne disease outbreak in North America, which occurred in 1993, when as many as 100 people died and 400,000 fell ill after drinking water contaminated with the cryptosporidium parasite in Milwaukee, Wisconsin. Outbreaks have also occurred in Canada, contaminating water supplies in Kitchener-Waterloo, Ontario; Cranbrook and Kelowna, British Columbia; and recently in North Battleford, Saskatchewan.

Giardia is a parasite that enters lakes and rivers through human sewage and animal waste. It causes gastrointestinal illness (e.g. diarrhea, vomiting, and cramps). The illness resulting from water contaminated with giardia is commonly called 'beaver fever', in recognition of the parasite’s frequent presence in beaver excrement.

Coliform bacteria are common in the environment and are generally not harmful to humans. Most strains of *Escherichia coli* are relatively harmless. But the strain that contaminated Walkerton’s water supply — *E. coli* O157:H7 has been associated with numerous disease outbreaks. It produces a powerful toxin in humans that causes severe bloody diarrhea and abdominal cramps. In the worst cases involving children under the age of five and the elderly, *E. coli* 0157:H7 can destroy red blood cells and cause kidney failure. It takes the ingestion of as few as 10 to 100 of these microscopic organisms — each about a tenth the size of a human red blood cell — to make people sick.

2. Chemical contamination

Chemical contamination may be grouped into three categories: inorganic chemicals; organic chemicals; and disinfection agents and by-products.

Inorganic chemical contaminants are generally metals and minerals such as antimony, asbestos, copper, lead and selenium. Inorganic contaminants occur naturally in the environment and the erosion of natural deposits may lead to the contamination of drinking water supplies. Inorganic contaminants may also be introduced to drinking water supplies through land use activities. For example, cyanide may be introduced to the environment through manufacturing and mining operations. There are serious health effects resulting from exposure to inorganic chemicals including gastrointestinal distress, organ damage, interference with mental development, and cancer.

Organic chemicals commonly found in drinking water include industrial chemicals, solvents and pesticides. Organic chemical contamination would almost certainly be the result of human activities. Health effects associated with organic chemicals include damage to the liver, kidneys, nervous and reproductive systems and other organs, and the increased risk of cancer.

Disinfection agents, used to control microbiological contamination, themselves pose health threats. Chlorine, chloramines, and chlorine dioxide have been linked with health effects including eye and nose irritation, stomach discomfort and anemia. These agents also react with organic materials found in drinking water, such as silt, to form by-products such as trihalomethanes and haloacetic acids. These compounds may cause liver, kidney and nervous system problems and are linked to an increased risk of cancer.

Comprehensive listings of chemical contaminants commonly found in drinking water and the associated health effects may be found by reviewing the *Guidelines for Canadian Drinking Water Quality*[3] or the EPA's *National Primary Drinking Water Standards*.[4]

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[3] Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial Committee on Environmental and Occupational Health (Canada), *Guidelines for Canadian Drinking Water*

3. Radiological contamination

Radioactive substances, known as radionuclides, are another family of potential waterborne contaminants. Exposure to radioactive material may come from natural sources, nuclear reactors, mining operations, or from nuclear weapons test explosions. Once they enter the body (commonly through air, food, or water), radionuclides can remain there for extended periods of time, in the worst cases for several months or years. Some radionuclides are carcinogenic, and some have much longer half-lives than others.

Please refer to the *Guidelines for Canadian Drinking Water Quality* or the *National Primary Drinking Water Standards*, cited above, for further information.

B. Land Use Activities That May Lead to Drinking Water Contamination

The following list of possible sources of water contamination is drawn from *Protecting Drinking Water Sources*[5], a 1999 report by the Auditor General of British Columbia.

Farms

- Animal-raising operations (pigs, chickens, cattle) can be a major source of nutrient overload in water, particularly when large quantities of manure are mixed with water and sprayed on land and some of this material leaches into groundwater or runs off into streams.
- Cattle grazing on steep slopes can increase runoff and sedimentation of streams.

Quality, 6th ed. (Ottawa: Minister of Health, 1996) [hereinafter *Guidelines*].

[4] Environmental Protection Agency. March 2001. *National Primary Drinking Water Standards.* [online] [Cited June 28, 2001]. <http://www.epa.gov/safewater/consumer/mcl.pdf> [hereinafter *National Primary Drinking Water Standards*].

[5] British Columbia. Office of the Auditor General. 1999. *Protecting Drinking Water Sources* (1998/1998 Report No. 5) [online under "Reports"] [Cited June 28, 2001]. <http://bcauditor.com/AuditorGeneral.htm>

- Feedlots and factory farms can contaminate water with fecal matter that may carry bacteria such as E. coli or pathogens such as cryptosporidium.
- Runoff triggered by rain or melting snow on cleared farmlands may wash sediment into water.
- Pesticides and herbicides can leach into groundwater or wash into streams or storm sewers (urban lawns, golf courses, parks, and gardens are also common sources).

Gravel pits and mines

- Gravel pits or other digging operations can disturb soils, causing sediment to wash into nearby water bodies, or expose groundwater and surface water to other contaminants such as acid-generating waste rock.

Urban developments

- Cleared land for urban developments may leave soil exposed for months at a time, leading to significant amounts of sediment washing into streams.

Poorly constructed or uncapped wells

- These are a common source of groundwater contamination.

Pavement

- Roads, parking lots, airports, and other paved surfaces can accelerate runoff into nearby waters. The faster and heavier the runoff, the more debris, including sediment and pollutants, is carried into the water.

Logging

- Logging and associated road-building can increase erosion and turbidity and, in some cases, cause algal blooms. Forest fires, like prairie grass fires, can burn off ground cover, leading to increased erosion.

Air pollutants

- From cars to factories, pollutants pumped into the air can mix with rainwater or snow or be carried by wind into water bodies.

Sewage treatment plants and factories

- A variety of chemical and other contaminants found in sewage and industrial effluents can enter water bodies that also serve as drinking water sources.

III. MULTI BARRIER APPROACH

Multiple-barrier water treatment programs are the most likely to cost-effectively maintain high quality tap water.[6] There are four primary means for maintaining good drinking water quality:

- protecting water sources;
- ensuring adequate water treatment;
- building and maintaining a well-designed and operated water distribution system with a continuous flow and pressurized pipes and the presence of residual disinfectant to counter bacterial re-growth; and
- comprehensive testing of drinking water.

Specific legislative and regulatory options for implementing a multi-barrier approach to water treatment will be identified in Part IV.

A. Protected Water Sources

Whether the water source is a well from which groundwater is drawn or a surface water body such as a lake, reservoir, river or stream, protecting water sources from possible contamination is the first and most important aspect of a safe drinking water strategy.

Protecting water sources requires that potentially destructive land uses be restricted or eliminated in those

[6] *Ibid.* at 7-21.

areas where the chance of groundwater or surface water contamination is high. Agriculture, forestry, gravel and mining operations, sewage disposal, urban developments, roads, air pollution, and forestry can all contribute to potentially harmful contaminants entering drinking water supplies.

If effective management of land use occurs in watersheds, the chances of contaminants and pathogens being transported in runoff to surface waters or percolating through subsurface soils to groundwater are greatly reduced.

B. Water Treatment

The second line of defence, water treatment, is itself multi-layered and usually includes disinfection.

Perhaps the most important factor in treating water is to ensure that the water itself is free of sediment. Surface waters are much more likely than groundwater to experience periodic or chronic turbidity problems. The *Guidelines* emphasize control of sediment and organic material in water as part of an integrated water treatment program.

Turbid water can serve as a source of nutrients for waterborne bacteria, viruses and protozoa, which can be embedded in or adhere to particles in the raw water. This can make it very difficult to determine what micro-organisms are actually in the water, because they are attached to or obscured by the particles. Cloudy water can also undermine the ability of disinfectants to neutralize pathogens in the water both before and after they enter distribution systems.

Most water providers and public health officials maintain that some kind of disinfectant should be used once and possibly twice in the treatment chain. The potential for bacteria to re-grow in pipes carrying water to households is itself regarded by many water providers and health officials as a possible (if remote) source of disease outbreaks.

As reported elsewhere, chlorinated water has its own health risks. The greatest risk involves chlorine binding with organic particles in the water to form carcinogenic trihalomethanes. By using filters, water providers can

eliminate most if not all of the organic material and virtually eliminate THMs. As well, they can get rid of protozoa such as *cryptosporidium* that are highly resistant to chlorine.

Beyond filtration, several different options are open to water providers to further disinfect water. These include chlorine, chorine dioxide, chloramine, ozone, ultraviolet light, and activated carbon and ozone.

C. Clean Distribution System

A drinking water distribution system, if not properly designed or maintained, can be a source of contamination. Contamination occurring in a distribution system might result from bacterial re-growth in the distribution system or leaks in the distribution system allowing silt, sewage or other matter into the distribution system.

Contamination may also result from the materials used in a distribution system, such as the use of pipes or solder containing lead.

D. Comprehensive Testing

Designing an adequate testing program for a water system requires addressing both the scope of contaminants tested for and the frequency of testing.

As discussed in Part IV, the scope of contaminant testing will likely vary from water system to water system. Determining the proper scope of testing can be accomplished through conducting an initial broad suite of testing combined with an assessment of potential sources of contamination, both natural and human-induced, that may influence drinking water quality.

In setting the frequency of testing for individual contaminants, the health effects of the contaminant, the population served, and the ability and cost of testing for a particular contaminant must all be taken into account.

The health effects of drinking water contaminants are often described as "acute" or "chronic." Acute effects occur within hours or days of the time that a person consumes a

contaminant. People can suffer acute health effects from almost any contaminant if they are exposed to extraordinarily high levels (as in the case of a spill). In drinking water, microbes, such as bacteria and viruses, are the contaminants with the greatest chance of reaching levels high enough to cause acute health effects. Chronic effects occur after people consume a contaminant at a level over safe levels for many years. The drinking water contaminants that can have chronic effects are chemicals, such as disinfection by-products, solvents, and pesticides; radionuclides, such as radium; and minerals, such as arsenic.[7] Contaminants that are likely to pose a risk of acute contamination – such as microbiological contamination and nitrates – may need to be monitored more frequently than contaminants that pose a risk of chronic contamination.

Most contaminant standards levels, such as those found in the Canadian *Guidelines* or the *National Primary Drinking Water Standards* set by the EPA, are based on the concept of lifetime exposure. According to this principle, a person could drink water containing that level of contaminant (or lower) for a "lifetime" and not suffer substantially increased health risks. Standards for most chemical and radiological contaminants are set using a lifetime exposure assumption. Standards for microbiological contaminants are set based on risks posed from one-time exposure. Most authorities, including Health Canada and the EPA, recommended that frequency of testing be based upon the population served by the water system.

Finally, the scope and frequency of testing will be limited by the cost and reliability of testing. For example, the Canadian *Guidelines* state that it is "not practical or technically feasible to monitor for all [microbiological] pathogens in drinking water."[8] Consequently, testing for microbiological contamination is often done through testing for 'indicator organisms' that, if present in water, may indicate contamination by harmful disease-causing bacteria, protozoa, or viruses.[9] Testing for chemical contamination,

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[7] Environmental Protection Agency. Updated May 23, 2000. *What are the health effects of contaminants in drinking water?* [online] [Cited July 2, 2001]. <http://www.epa.gov/safewater/dwh/health.html>

[8] *Guidelines*, *supra* note 3 at 12.

[9] Among the most commonly looked for indicator organisms are coliforms. Trace amounts of "total coliforms" may be considered acceptable if they occur infrequently in tests, but if they show up more often, health officials become concerned. Of greater worry is the presence of faecal coliforms. When

particularly volatile organic chemicals (generally industrial chemicals and solvents) and synthetic organic chemicals (including pesticides), tends to be relatively expensive. Thus, testing for these chemical contaminants will generally occur less frequently, particularly for smaller systems, which may place those residents at increased risk.

IV. COMPARISON

This section identifies legislative and regulatory options for implementing protection based upon the multi- barrier approach. The criteria selected for comparison are:

- water source protection;
- testing requirements and water quality standards;
- regulation of testing laboratories;
- water treatment;
- construction and operation of water delivery systems;
- certification of system operators;
- reporting requirements; and
- regulatory supervision.

This section also identifies how Canadian provinces and territories are addressing each of these criteria, and compares the Canadian performance with selected international jurisdictions.

It should be noted that legislation, by itself, will not lead to the protection of drinking water. Good legislation must be supported with, at a minimum, the funding adequate to implement the legislation, to build and maintain drinking water treatment and distribution systems, and to hire enforcement personnel. Good legislation also requires strong enforcement including, particularly, the political will to limit or restrict human activities that threaten drinking water. While these issues are beyond the scope of this paper, a comprehensive analysis of the drinking water protection efforts of any jurisdiction must include consideration of these issues.

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these turn up, it is considered strong evidence that a water supply may be contaminated. The presence of *Escherichia coli*, one species in the faecal coliform group, is a definite indicator of the presence of faeces. See *e.g. Guidelines, supra* note 3 at 12.

A. Water Source Protection

As mentioned in Part III, protecting water sources is one of the most efficient and cost-effective methods of protecting drinking water quality. There are a number of legislative options for protecting drinking water sources,

1. Legislative and regulatory options

Legally, protecting water sources may be accomplished in a number of ways:

- ***Land Purchase*:** One obvious option for protecting drinking water sources is for water providers to purchase lands that may affect drinking water quality and to close those lands to activities that may contaminate drinking water.

  In Canada, the City of Saint John, New Brunswick has instituted a program to purchase land in one of its two watersheds, the Loch Lomond. Saint John owns more than one-third of the land and intends to purchase more as it becomes available. (Saint John's other watershed is crown land, meaning that purchase of the lands has not been necessary.)[10]

  New York City has received federal approval to purchase lands in its watershed at a cost of up to $250 million (US), rather than build filtration plants at an estimated cost of $2-$4 billion dollars, which would otherwise be required for New York City's water supply under the federal *Safe Drinking Water Act*.

  Provincial legislation can also facilitate the acquisition of land to protect drinking water. For example, section 27 of the British Columbia *Water Act* grants to any domestic water "licensee" the right "to expropriate any land the control of which by the licensee would help to prevent the pollution of the water authorized to be diverted."[11]

  Similarly, most Canadian municipalities have been granted powers of expropriation that could be used to acquire lands to protect drinking water quality. For example,

[10] *Waterproof*, *supra* note 1 at 17.
[11] *Water Act*, R.S.B.C. 1996, c. 483, s. 27.

the Ontario *Public Utilities Act* grants municipalities the power to "expropriate land, water and water privileges … as may be considered necessary …for protecting the waterworks or preserving the purity of the water supply."[12]

Additionally, municipalities may be granted control over provincial crown lands to ensure protection of surface water. For example, the cities of Vancouver and Victoria have been given, at nominal cost, long-term leases to virtually the entire watersheds that provide water supplies. These leases have allowed the cities to close watersheds to human and industrial activities.

In some cases, it will not be practical or feasible for a municipality to obtain control over its watersheds or lands surrounding its wells. The City of Toronto, for example, draws its water from Lake Ontario, making it impossible to control or restrict most activities that might influence drinking water quality. In such cases, other regulatory tools such as assessments and regulatory restrictions can help protect drinking water systems.

- ***Assessments and Planning***: Water source assessments are an important part of identifying and controlling contamination of drinking water. A watershed assessment can accomplish (1) the identification of the area of land that water passes through to reach the drinking water intake; (2) the mapping of the locations of potential sources of drinking water contamination; (3) the identification of future activities that could affect drinking water quality; and (4) the preparation of contingency plans to deal with sudden events (such as floods or spills) that could threaten the drinking water supply.

  The U.S. federal Safe Drinking Water Act has introduced source water assessments. Section 1453 directs EPA to publish guidance for states to implement source water assessment programs that delineate boundaries of assessment areas from which systems receive their water, and identify the origins of contaminants in delineated areas to determine systems' susceptibility to

[12] *Public Utilities Act*, R.S.O. 1990, c. P.52, s. 2(1).

contamination.[13] Under section 1418, states with approved assessment programs may be exempted from some monitoring programs.[14] Incentives, such as monitoring relief, could serve as a useful tool in Canada to encourage water protection measures where the political will or jurisdiction to order the protection directly may be questionable.

The information contained in a water source assessment may be used as a basis for imposing restrictions on activities in water source areas (see below) or conducting voluntary compliance and public education campaigns aimed at reducing the possibility of drinking water contamination.

A recent bill passed in British Columbia – Bill 20, the *Drinking Water Protection Act* – gives provincial officials authority to require an assessment of the drinking water source area and treatment systems.[15] However, the relevant sections of Bill 20 have not been brought into force and the incoming government in British Columbia has announced the intention to review and possibly repeal, *inter alia*, Bill 20.

- ***Restrictions on Activities in Watersheds and Well Fields***: Legislative and regulatory controls, such as setbacks from surface water, drinking water source designations, restrictions on activities, zoning and health ordinances and the power to issue "stop-work" or remedial orders are all means through which jurisdiction may prevent – or lessen – contamination of drinking water. (The power of regulatory officials to make orders is more fully discussed in Part IV, section G.)

  Manitoba, New Brunswick, Newfoundland and Nova Scotia have enacted legislation allowing for the creation of protected watersheds or wellfields.[16] A legally recognized watershed or wellfield designation can ensure that potentially harmful land use activities are controlled in situations where the municipality does not own the land. Newfoundland, according to our count, has identified 265 such designated areas.[17]

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[13] *Safe Drinking Water Act*, 42 U.S.C. 300 g-1 (§1453).
[14] *Ibid*., §1418.
[15] Bill 20, *Drinking Water Protection Act*, 5th Sess., 36th Parl., 2001, cls.18-22 (3rd reading 11 April 2001).
[16] See Table 1 below.
[17] House of Assembly (Newfoundland & Labrador). Statutes and Regulations. [online - reference is to

Some jurisdictions, such as Quebec, limit potable water sources within specified distances of certain activities.[18]

The U.S. *Safe Drinking Water Act,* Part C (§§ 1421 – 1429), requires the EPA to promulgate regulations for state underground injection control programs to protect underground sources of drinking water.[19] Many industries in the U.S. and Canada dispose of industrial waste – particularly contaminated wastewater – by injecting it deep underground. This practice poses serious risks of contamination to underground aquifers. U.S. regulations contain minimum requirements for the underground injection of wastes to protect underground sources of drinking water and to require that a state prohibit any underground injection that was not authorized by state permit.

Additionally, section 1427 of the U.S. *Safe Drinking Water Act* establishes procedures for demonstration programs to develop, implement, and assess critical aquifer protection areas already designated by the EPA Administrator as sole source aquifers. Section 1428 establishes an elective state program for protecting wellhead areas around public water system wells. If a state established a wellhead protection program by 1989, and the EPA approved the state's program, then the EPA may award grants covering between 50% and 90% of the costs of implementing the program.

In the Northwest Territories and Nunavut, the Chief Medical Officer is empowered to stop any activity or proposed activity that "may adversely affect the quality of raw water."[20]

Ontario does not have any legislation that allows for the designation of protected watersheds or wellfields, nor does it have legislation specifically prohibiting activities within a certain distance of water sources.

"Notices of Protected Water Supplies"][Cited July 2, 2001]. <http://www.gov.nf.ca/hoa/sr/titleindex2.htm#W>

[18] Directive 001 of the Quebec Minister of Environment, *Distances à respecter d'une prise d'eau potable par rapport à certains usages ou activités*, (Fiche Numero GC014)

[19] *Safe Drinking Water Act, supra* note 13 (§§1421-1429).

[20] *Public Water Supply Regulations*, R.R.N.W.T. 1990, c.P-23.

B. Contaminant Standards and Testing Requirements

Health Canada has identified more than 80 harmful substances that are commonly found in drinking water. By no means comprehensive, this list includes items such as micro-organisms and bacteria, pesticides, heavy metals, petroleum by-products and radioactive materials.

Gastrointestinal illnesses are commonly associated with waterborne microbiological contaminants such as *giardia*, and symptoms surface within a few days of a person drinking unsafe water. Other serious illnesses are associated with the long-term ingestion of waterborne chemicals and other contaminants. These illnesses include some types of cancer, liver and kidney disorders, birth defects, and others.

Many of the illnesses triggered by long-term exposure to unsafe drinking water involve contaminants that are colourless, odourless and tasteless. Frequent and stringent testing is the only way to determine whether these agents are present in water, making it unsafe to drink.

1. Legislative and regulatory options

Contaminant standards and water testing are necessary components in keeping drinking water safe. Contaminant standards limit the concentration of specified contaminants allowed in drinking water. Frequent testing identifies the presence of harmful substances in drinking water so that appropriate prevention, treatment or closure orders can be made. (A full list of the standards and testing requirements in place in the jurisdictions surveyed appears in Table 1 below.)

a) Setting contaminant standards: There are few, if any, legislative or regulatory requirements in Canada for guiding the selection of contaminants for standard setting or for determining the appropriate standards. The Federal-Provincial Subcommittee on Drinking Water sets the non-binding *Guidelines for Canadian Drinking Water Quality*. In setting the *Guidelines*, the Subcommittee takes certain factors into account; for example, whether the standard is achievable by available water treatment methods at a

reasonable cost. With regard to carcinogenic contaminants, the Subcommittee attempts to set the standard at a level so that the increased risk of cancer is "essentially negligible."[21] Canada has been subject to criticism that some of its standards are not stringent enough or were set at levels that are now out of date.[22]

Section 1412 of the U.S. *Safe Drinking Water Act* instructs the EPA on how to select contaminants for regulation and specifies how the EPA must establish national primary drinking water regulations once a contaminant has been selected.[23] Every 5 years, the EPA must publish a list of contaminants that may warrant regulation. Starting in 2001, and every 5 years thereafter, the EPA must determine whether or not to regulate at least 5 of the listed contaminants. The *Act* directs the EPA to evaluate contaminants that present the greatest health concern and to regulate contaminants that occur at concentration levels and frequencies of public health concern.

The U.S. *Safe Water Drinking Act* sets out a two-part process for developing national drinking water regulations. For each contaminant that the EPA determines merits regulation, the EPA must set a non-enforceable maximum contaminant level goal (MCLG) at a level at which no known or anticipated adverse health effects occur and which allows an adequate margin of safety. The EPA must then set an enforceable standard, a maximum contaminant level (MCL), as close to the MCLG as is "feasible" using best technology, treatment techniques, or other means available (taking costs into consideration). When developing regulations, the EPA is now required to (1) use the best available, peer-reviewed science and supporting studies and data; and (2) make publicly available a risk assessment document that discusses estimated risks, uncertainties, and studies used in the assessment.

The advantage of the approach used by the EPA to setting contaminant standards is that it expresses the MCLG on the basis of the best available science without importing any other consideration. It thus creates a transparent process

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[21] Federal-Provincial Subcommittee on Drinking Water. February 1995. *Approach to the Derivation of Drinking Water Guidelines.* [online at page 4] [Cited July 2, 2001] http://www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/dwgsup_doc/part-1.pdf.

[22] See, *e.g.*, "Ontario Town Fears Tap Water Tragedy" *Globe and Mail* (12 October 2001) A5, regarding Canada's trichloroethylene standard.

[23] *Safe Drinking Water Act, supra* note 13, §1412.

that identifies health risks separately from that which may be practicable and gives a clearer picture of the adequacy of drinking water standards and available treatment.

b) Establishing testing requirements: There are two general approaches for imposing testing requirements on water suppliers. Mandatory sampling may be required for all water suppliers (or classes of water suppliers). Alternatively, testing requirements may be imposed on individual water systems through permit approval processes or orders.

In the U.S., the EPA, generally speaking, requires mandatory testing for all contaminants for which a standard has been set (there are over 80 contaminants including microbiological, chemical and radiological contaminants).[24] Testing requirements may vary between groundwater supplies and surface water supplies. Additionally, individual water systems may be exempted from specific testing requirements if a water supply has not previously shown the presence of a contaminant and scientific analysis indicates that it is unlikely that human or natural activities will affect the system's water quality in the future.[25] Frequency of testing for many contaminants in the U.S. is based on population.

Ontario has revised its drinking water regulation as part of "Operation Clean Water." Effective in 2002, Ontario water suppliers will have to test for microbiological and chemical contaminants.[26] Sampling for radiological contamination is not required province-wide basis, but may be imposed on a case-by-case basis. Ontario's *Drinking Water Protection Regulation* does not provide an exemption mechanism, so testing appears to be required regardless of previous testing results.

2. Jurisdictional comparison

This table shows the water quality standards and testing requirements in place in each Canadian province and territory, and the equivalent requirements in the U.S. and European Union.

[24] *Safe Drinking Water Act, supra* note 13, §1412.
[25] *Safe Drinking Water Act, supra* note 13, §1415.
[26] *Drinking Water Protection Regulation*, O. Reg. 459/00, s. 7.

TABLE 1 **JURISDICTION**	**STANDARDS AND TESTING REQUIREMENTS**
Alberta	- Water quality must meet the microbiological, chemical and radiological limits in the Canadian *Guidelines*.[27] - The Director within the Ministry of Environment determines the parameters that must be analyzed for each municipality.[28] - Water suppliers are required to monitor surface waters twice per year and groundwater once per year.[29]
British Columbia	- Water suppliers ("purveyors") must supply "potable water" that meets the contaminant limits imposed by a Schedule to the *Safe Drinking Water Regulation* and "is safe to drink and fit for domestic purposes without further treatment."[30] - The *Safe Water Drinking Regulation* contains an extensive list of chemical and physical parameters, but monitoring is not required for these parameters unless an approval or order requires it. Sampling frequency is discretionary under the Ministry of Health and imposed through individual permits.[31]
Manitoba	- Testing for chlorine residuals and microbiological sampling is required and the frequency is mandated by regulation. All other testing is discretionary.[32]
Newfoundland	- No testing required. - The provincial government may undertake some testing.
New Brunswick	- Water quality standards and sampling frequency is discretionary. Public water

[27] *Potable Water Regulation,* Alta. Reg. 122/93, ss. 6(1).
[28] *Potable Water Regulation, ibid.,* ss. 12 and 19(2).
[29] *Potable Water Regulation, ibid.*, s. 19(4).
[30] *Safe Drinking Water Regulation,* B.C. Reg.120/2001, O.I.C.491/2001, s. 5.
[31] *Ibid.*, ss. 4(4) and 5(3), and Schedules A, B and C.
[32] *Water Supplies Regulation,* Man. Reg. 330/88 R, s. 10.

	suppliers must have a sampling plan that is approved by the Ministry of Environment.[33]
Northwest Territories	- Operators are required to ensure tests are performed monthly for coliforms and annually for 25 chemical and physical parameters by regulation.[34]
Nova Scotia	- Disinfection residual testing, turbidity sampling and fluoride level sampling (if used) is required daily. - Microbiological sampling must meet the Canadian *Guidelines* (population-based). - Thirty chemical and physical parameters must be sampled, once a year for surface water, and once every two years for groundwater. Water providers have an obligation to provide water that meets the microbiological, chemical and physical contaminant standards of the *Guidelines*.[35]
Nunavut	- Operators are required to ensure tests are performed monthly for coliforms and annually for 25 chemical and physical parameters.[36]
Ontario (pre-Walkerton)	- Testing is discretionary. - The government has developed non-binding objectives, but these standards are only applicable if required by an individual permit.[37]
Ontario (post-	Ontario's new *Drinking Water Protection*

[33] *Potable Water Regulation*, N.B. Reg. 93-203, s. 10.
[34] *Public Water Supply Regulation*, *supra* note 20, s. 9.
[35] *Waste and Wastewater Facility Regulations*, N.S.Reg. 140/2000, s. 16. See also incorporated into the regulations, Nova Scotia Ministry of Environment and Labour. October 2000. *Guidelines for Monitoring Public Drinking Water Supplies*, [online] [Cited July 2, 2001]. <http://www.gov.ns.ca/enla/pubs/dw_gui.PDF>
[36] *Public Water Supply Regulations*, *supra* note 20, s. 9.
[37] Ontario Ministry of Environment and Energy. February 1999. Provincial Water Quality Objectives. [online at Appendix A] [Cited July 2, 2001]. <http://www.ene.gov.on.ca/envision/gp/3303e.pdf>

Walkerton, effective 2002)	*Regulation*, which will become effective in January 2002, sets out new testing requirements. Binding testing requirements will be in effect (except in the case of small systems, for example, serving less than five residences) for: - Microbiological characteristics - Chlorine residuals - Volatile organic compounds - Inorganic chemicals - Nitrates, and - Pesticides. - Radiological contaminant testing is not mandatory, but may be required on a case-by-case basis. - The frequency of testing varies by type of contaminant and the population served by the water system, but the frequency of testing is rigorous.[38]
PEI	- Water testing not required and there are no binding water quality standards.
Quebec	- Quebec's new "Regulation Respecting the Quality of Drinking Water" sets stringent contaminant standards and testing requirements.[39] - Binding standards for 77 contaminants or water quality parameters.[40] - Microbiological testing (or control) for a variety of parameters is mandatory for systems serving over 20 residents and testing frequency is population based.[41] - Testing for inorganic substance, physical water quality indicators and some inorganic substances is mandatory for all systems serving more than 20 residents.[42]
Saskatchewan	- Bacteriological testing after water system construction or alteration required. - Daily chlorine residual testing required.

[38] *Drinking Water Protection Regulations*, *supra* note 26.
[39] *Regulation Respecting the Quality of Drinking Water*, R.S.Q., c. Q-2, r. 4.1, (under the *Environment Quality Act*) [online] [cited June 28, 2001]< www.menv.gouv.qc.ca/eau/potable/fiches/index-en.htm >
[40] *Regulation Respecting the Quality of Drinking Water*, *supra* note 39, Schedules 1 and 2.
[41] *Regulation Respecting the Quality of Drinking Water*, *supra* note 39, ss. 5 – 8, 10 – 13 and Schedule 1.
[42] *Regulation Respecting the Quality of Drinking Water*, *supra* note 39, ss. 18, 19, 21 and 22.

	- All other testing is discretionary. Saskatchewan has created Municipal Drinking Water Quality Objectives, but these are not binding unless an approval or operating permit specifies.[43]
Yukon	- Testing is discretionary.[44]
United States	- Testing for over 80 parameters (microbiological, chemical and radiological) is required. The frequency for testing is population-based.[45]
European Union, starting 2003.	- Testing for over 45 parameters (microbiological, chemical and radiological) is required. The frequency for testing is population-based.[46]

C. Regulation of Testing Laboratories

Certification or accreditation of water sampling labs ensures that the labs selected to analyse critical health threats have trained staff, proper equipment and the appropriate procedures that will produce accurate results.

1. Legislative and regulatory options

Ensuring the quality and accuracy of provincial testing may be accomplished by conducting all testing at a provincial lab, or by requiring water suppliers to test water at provincially approved labs, or by requiring that certified personnel conduct testing.[47]

2. Jurisdictional comparison

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[43] Saskatchewan (under the *Environmental Management and Protection Act), Water Pollution Control and Waterworks Regulations*, s. 25.

[44] See *Public Health and Safety Act*, S.Y 1997, c.18. Correspondence of Yukon Environmental Health Services, Sept. 11, 2000.

[45] *National Primary Drinking Water Standards*, *supra* note 4.

[46] EC, Council Directive 98/83/EC, Article 7, of 3 November, 1998 on the quality of water intended for human consumption.

[47] Water system personnel must conduct some testing, as a practical matter. For example, testing for chlorine residuals may be required 20 minutes after chlorine disinfection.

According to our survey, five jurisdictions require the use of provincially approved labs: British Columbia, New Brunswick, Ontario (effective early 2001), Quebec and the Yukon. Six other jurisdictions attempt to ensure accuracy by testing drinking water at provincial labs or at labs suitable to the relevant agency. These jurisdictions include Alberta, Manitoba, Newfoundland, Nova Scotia, Nunavut and Saskatchewan. The Northwest Territories does not require water testing at provincially approved labs.

Alberta: Microbiological samples must be tested at the provincial lab (water providers are not charged for these tests). Other types of testing must be performed at a lab approved by the Director (as named under the *Potable Water Regulation*) or by an approved analytical method. There is currently no lab accreditation program.[48]

British Columbia: Testing must be performed at accredited labs.[49]

Manitoba: The provincial government selects (by contract) the labs where testing is performed. There is no requirement that the labs themselves be accredited.[50]

Newfoundland: The use of accredited labs is not required, but testing performed by the province is done at the provincial lab or another accredited lab. (Generally, Newfoundland does not require testing, although it undertakes some testing itself.)

New Brunswick: Testing must be performed at accredited labs.[51]

Northwest Territories: The use of accredited labs is not required.

Nova Scotia: Labs need not be accredited, but water suppliers must conduct testing at labs acceptable to the Department of Environment. The province's lab accreditation policy is being drafted.[52]

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[48] *Potable Water Regulation*, *supra* note 27, s. 19. Correspondence of Kara Chinniah, Municipal Programs Development Branch, Government of Alberta, Sept. 10, 2000.

[49] *Safe Drinking Water Regulation*, *supra* note 30, ss. 1 (definitions) and 5.

[50] Correspondence of Morley Smith, Environment Officer, Manitoba Conservation, Sept. 8, 2000.

[51] *Potable Water Regulation*, *supra* note 33, s. 9.

[52] Correspondence of Steve Warburton, Department of Environment, September 7, 2000.

Nunavut: The use of accredited labs is not required.

Ontario: Since February 28, 2001, testing must be performed at an accredited lab. Lab accreditation was not previously required.[53]

PEI: The use of accredited labs is not required.

Quebec: The use of accredited labs is required.[54]

Saskatchewan: The use of accredited labs is not required; however, testing is generally done at the provincial lab or a lab acceptable to the province.

Yukon: Testing must be performed at an accredited lab.[55]

C. Water Treatment

Effective water treatment ensures that any contaminated water is purified and made potable. (A comparison of the water treatment requirements in the jurisdictions surveyed appears in Table 2.)

1. Legislative and regulatory options

From a general regulatory standpoint, water treatment can be approached in two ways. First, water providers may be required to treat water with specific methods. For example, introducing chlorine and maintaining a chlorine residual throughout the water distribution system is required in some jurisdictions. Second, regulations may establish certain standards (for example, no faecal coliforms), but leave the choice of how to meet them up to the water provider.

The U.S. *National Primary Drinking Water Regulations* under the *Safe Drinking Water Act* set certain contaminant standards with direct reference to "treatment techniques." For example, surface water systems must disinfect and

[53] *Drinking Water Protection Regulation*, *supra* note 26, ss. 2 and 7.
[54] *Regulation Respecting the Quality of Drinking Water*, s. 31, *supra* note 39.
[55] Correspondence of Yukon Environmental Health Services, Sept. 11, 2000.

filter water to ensure 99.99 removal or inactivation of viruses.[56]

2. Jurisdictional comparison

This table lists the water treatment requirements in place in each Canadian province and territory.

Table 2 **JURISDICTION**	**WATER TREATMENT REQUIREMENTS**
Alberta	- Disinfection is required for both groundwater and surface water. Chemically-assisted filtration or slow-sand filtration is required for surface water. The province regulates treatment techniques.[57]
British Columbia	- Disinfection (chlorination or other approved disinfection) is required.[58]
Manitoba	- Chlorination is required.[59]
Newfoundland	- There is no mandatory treatment requirement.
New Brunswick	- There are no mandatory requirements for treatment, although treatment may be required through the approval process for individual municipal water systems.[60]
NW Territories	- Chlorination is required.[61]
Nova Scotia	- Chlorination is required.[62]
Nunavut	- Chlorination is required.[63]
Ontario (pre-	- No treatment required.

[56] *National Primary Drinking Water Standrads*, *supra* note 4 at 4.
[57] *Potable Water Regulation*, *supra* note 27, s. 11. Also correspondence of Kara Chinniah, Municipal Programs Development Branch, Government of Alberta, Sept. 10, 2000.
[58] *Safe Drinking Water Regulation*, *supra* note 30, s. 6.
[59] *Water Supplies Regulation*, *supra* note 32, s. 10.
[60] Correspondence with Neil Thomas, Public Health Management Unit, Sept. 7, 2000.
[61] *Public Water Supply Regulation*, *supra* note 20, ss. 15 and 16.
[62] Correspondence of Steve Warburton, Nova Scotia Environment, Sept. 11, 2000.
[63] *Public Water Supply Regulation*, *supra* note 20, ss. 15 and 16.

Walkerton)	
Ontario (post-Walkerton)	- Groundwater must be chlorinated. - Surface water must be chlorinated and subjected to chemically assisted filtration.[64]
P.E.I.	- No treatment required.
Quebec	- Continuous disinfection is required for groundwater and continuous disinfection and filtration is required for surface waters (or groundwater subject to the influence of surface waters). Disinfection may be performed with chlorine or by other disinfection method that has equivalent disinfection potential.[65]
Saskatchewan	- Chlorination is required.[66]
Yukon	- Treatment is discretionary.

D. Construction and Operation of Water Delivery Systems

It may seem obvious to state that the purpose of water treatment and supply facilities is to ensure the delivery of safe, clean water. What is less obvious is that the facilities themselves can be health hazards. An example of this occurs when municipalities try to economize on infrastructure costs by placing sewer pipes and drinking water pipes in the same trench. Under these circumstances, a broken sewer line can contaminate a drinking water line. Additionally, a poorly designed, constructed or maintained plant may not actually protect drinking water.

The potential for harm from drinking water treatment materials is serious enough that the federal government has proposed the *Drinking Water Materials Safety Act,* which would prescribe national, health-based standards for drinking water materials, which include water system components, water treatment devices and chemical additives. The *Act* would require third-party certification of all

[64] *Drinking Water Protection Regulation, supra* note 26, ss. 5 and 6.
[65] *Regulation Respecting the Quality of Drinking Water, supra* note 39, ss. 5 - 8.
[66] *Water Pollution Control and Waterworks Regulation, supra* note 43, s. 23.

drinking water materials before they are imported to or sold in Canada. Unfortunately, the proposed *Drinking Water Materials Safety Act* has languished since it was introduced in 1997.

According to the Alberta Environmental Law Centre, the EPA previously provided to the provinces information on what kinds of additives and materials may be used to achieve safe drinking water standards.[67] However, the EPA's advice program ended in 1998. Only a few of the provinces and territories now regulate or approve drinking water materials.

(A summary of the legislative and regulatory requirements for all of the jurisdictions surveyed appears in Table 3.)

1. Legislative and regulatory options

Our research has identified two regulatory options for regulating the construction and operation of water treatment and delivery systems. Regulatory bodies can adopt standards and requirements that all water suppliers must meet. Alternatively, a regulatory body could require approvals for construction and operation and review proposals and formulate requirements on a case-by-case basis.

Alberta has adopted the requirement that water treatment and delivery systems conform to the requirements of the latest edition of the "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems" published by the Alberta Department of the Environment.[68] Chemicals used in the water treatment process must be approved by Department of the Environment or have been approved by the National Sanitation Foundation, and the chemical must be used in a manner consistent with Alberta's "Standards and Guidelines."[69] Additionally, water testing must be performed using an approved analytical method (methods of approval are described in the regulation).[70]

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[67] E. Hughes, "Water, Water Everywhere…The Proposed *Drinking Water Materials Safety Act*;" (2000) 15:1 Environmental Law Centre News Brief.
[68] *Potable Water Regulation, supra* note 27, s. 4.
[69] *Potable Water Regulation, supra* note 27, s. 8.
[70] *Potable Water Regulation, supra* note 27, s. 19.

2. Jurisdictional comparison

The following table lists the requirements for design, construction and materials used in water systems for each Canadian province and territory.

Table 3 **JURISDICTION**	**DESIGN, CONSTRUCTION AND MATERIAL STANDARDS**
Alberta	- Alberta requires an approval as a prerequisite to operating a drinking water system.[71] - Pursuant to the *Potable Water Regulation,* all water treatment systems must be designed, constructed and operated in accordance with standards issued by Alberta.[72] - Additionally, either the Environment Ministry or the independent, U.S.-based, National Sanitation Foundation must approve all chemicals used for water treatment.[73]
British Columbia	- B.C. requires both a construction permit and an operating permit. Provincial regulators review construction plans prior to issuing a construction permit. There are no binding standards related to design, construction, materials, or treatment methods or additives.[74]
Manitoba	- The Minister of Health must approve plans and specifications before a public water system can be constructed, operated or altered. There are no binding standards related to design, construction, materials, or treatment methods or additives.[75]
Newfoundland	- The Minister of Environment must approve

[71] *Potable Water Regulation*, *supra* note 27, s. 3.
[72] *Potable Water Regulation*, *supra* note 27, s. 4.
[73] *Potable Water Regulation*, *supra* note 27, s. 8.
[74] *Safe Drinking Water Regulation*, *supra* note 30, ss. 2 and 4.
[75] *Water Works, Sewerage and Sewage Disposal*, Man. Reg. 331/88 R, s. 2.

	plans and specifications before a public water system can be constructed, operated or altered. There are no binding standards related to design, construction, materials, or treatment methods or additives.[76]
New Brunswick	- New Brunswick regulates water system design and construction. There are construction and materials standards for wells, but none for water treatment systems.[77]
Northwest Territories	- Approval to construct a drinking water treatment system is required. There are binding requirements with respect to construction standards and materials.[78]
Nova Scotia	- Public water systems must be classified (based on population served) and registered with the province. There are no binding standards regarding design, construction, or materials used.[79]
Nunavut	- Approval to construct a drinking water treatment system is required. There are binding requirements with respect to construction standards and materials.[80]
Ontario (pre-Walkerton)	- The establishment, alteration, extension or repair of water works requires an approval issued by the Environment Ministry. Plans and specifications for water works may be reviewed during the approval process. There are no binding standards for design, construction or materials.[81]
Ontario (post-Walkerton)	- The establishment, alteration, extension or repair of waterworks requires an approval issued by the Environment

[76] *Environment Act*, S.N. 1995, c. E-13.1, s. 6.
[77] *Water Quality Regulations*, N.B. Reg. 82-126, s. 3.
[78] *Public Water Supply Regulation*, *supra* note 20, ss. 3, 14-15, and 18-20.
[79] *Water and Wastewater Facility Regulation*, *supra* note 35, ss. 4 and 5.
[80] *Public Water Supply Regulation*, *supra* note 20, ss. 3, 14-15, and 18-20.
[81] *Ontario Water Resources Act*, R.S.O. 1990, c. O-40, s. 52.

	Ministry. Plans and specifications for water works may be reviewed during the approval process. There are no binding standards for design, construction or materials.[82]
P.E.I.	- Approvals are not required and there are no binding standards for design, construction or materials.
Quebec	- The construction or operation of public waterworks requires approval and there are binding standards regarding design, construction and materials.[83]
Saskatchewan	- The construction or operation of public waterworks requires approval and there are binding standards regarding design, construction and materials.[84]
Yukon	- The construction or operation of public waterworks requires approval and there are binding standards regarding design, construction and materials.

E. Certification of System Operators

The best-designed water treatment and delivery facility is of little benefit if the people running the system are not properly trained and/or certified. Operator certification is considered such an important issue in the United States that individual states must establish mandatory certification programs in order to be eligible for certain infrastructure grants.

Training and certification are, strictly speaking, separate issues. Certification is generally accomplished through a regulatory body who considers of experience, education and examination. Depending on the certification program or the level of certification within a program, classroom, on-the-job or equivalent training may not be required.

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[82] *Ibid.*
[83] Correspondence of Jean Maurice Latulippe, Quebec Ministry of the Environment, November 14, 2000.
[84] *Water Pollution Control and Waterworks Regulation, supra* note 43, ss. 19-22.

1. Jurisdictional comparison

In Canada, only Alberta, Nova Scotia, Ontario and Quebec require the use of certified operators. In Quebec, an operator certification program is proposed, while Saskatchewan's recent regulatory changes will require that all municipal water facilities come under the direction of a certified operator within five years.[85]

F. Reporting Requirements

Prompt reporting of water testing results can go a long way toward alleviating the consequences of a waterborne disease outbreak. Yet in most provinces and territories, there is no requirement for the public to be promptly notified when water contamination occurs. Some provinces require that certain government officials be notified in the event of poor test results. But few provinces and territories require water suppliers to automatically notify the public, and public notification (including boil-water alerts) is only issued if the relevant agency feels it is necessary.

Such discretion is not allowed in the United States or European Union, where direct notification of the public is required. For example, in the U.S., water systems now have 24 hours to inform their customers of violations of EPA standards "that have the potential to have serious adverse effects on human health as a result of short-term exposure."[86] Water suppliers are required to inform customers about violations of less immediate concern in the first water bill sent out after the violation, in an annual report, or by mail within a year.[87]

Some provinces have also adopted mandatory public notification of health threats. Ontario's new *Drinking Water Protection Regulation* requires warning notices to be posted if the sampling, analysis or corrective actions related to microbiological contamination have not occurred or certain standard are violated. Nova Scotia has developed guidelines that state when boil-water alerts are required, a communication plan, suggested wording for the

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[85] See *supra* note 27, s. 16 (Alberta); *supra* note 35, ss. 6 and 7 (Nova Scotia); O. Reg. 435/93, ss. 5-14 (Ontario); *supra* note 39, s. 31 (Quebec).
[86] *Water on Tap*, *supra* note 2 at 9.
[87] *Ibid.*

alert and follow-up activities. However, these guidelines are not legally binding.

The need to report goes beyond informing consumers of immediate health threats. It is also important that consumers be informed of the overall quality of their drinking water. Both the U.S. and European Union require water suppliers to provide 'right-to-know' reports, which summarize water quality testing results and compare the quality of their water with the relevant standards. In the U.S., these reports are required annually, while in the European Union, such reports must be delivered every three years, starting in 2003. Some Canadian cities, such as Victoria, Vancouver, and Edmonton, are now preparing right-to-know reports. Ontario's new *Drinking Water Protection Regulation* requires right-to-know reports to be issued quarterly.

New Brunswick is unusual in having something that could be described as an 'no-right-to-know' provision. Under Section 6 of the New Brunswick *Potable Water Regulation*, health and environment officials are specifically prohibited from disclosing the results of a sample of well water to anyone but the well owner, unless the owner consents. This could be particularly problematic in situations where the public has access to a private well, such as at a gas station or campground. Additionally, this provision could be interpreted as prohibiting the government from notifying nearby well owners that there may be a problem with water quality.

(A comparison of the reporting requirements found in all of the jurisdictions surveyed is found in Table 4.)

1. Jurisdictional comparison

This table lists the requirements in place in each Canadian province and territory to ensure public notification of water quality.

Table 4 **JURISDICTION**	**Mandatory reporting of test results to government officials?** **Mandatory consumer notification of health threats?**

	Right-to-know report required?
Alberta	- Routine water testing results must be reported to the provincial government. Any malfunction of the plant must be reported to government officials.[88] - There is no requirement that water contamination or equipment malfunctions be reported to consumers. There is no requirement for the preparation of a public right-to-know report.
British Columbia	- Routine water testing results must be reported to the provincial government where testing is required. Public notification of potential health threats must be provided. Equipment malfunctions must be reported to government, but there is no corresponding requirement for public notification.[89] - There is no requirement for the preparation of a public right-to-know report.
Manitoba	- The province contracts with labs for microbiological testing and these results are reported to the provincial government.[90] - There is no requirement that water contamination or equipment malfunctions be reported to consumers. - There is no requirement for the preparation of a public right-to-know report.
Newfoundland	- There is no requirement that routine test results be reported to government; however, the province does most testing. - There is no requirement that water contamination or equipment malfunctions be reported to consumers. - There is no requirement for the preparation of a public right-to-know report. Newfoundland has made the results

[88] *Potable Water Regulation*, *supra* note 27, ss. 13 and 19.
[89] *Safe Drinking Water Regulation*, *supra* note 30, ss. 3 and 5.
[90] Correspondence of Morley Smith, Environment Officer, Manitoba Conservation, Sept. 8, 2000.

	of testing for trihalomethanes available on the Internet.
New Brunswick	- Routine water testing results must be reported to the provincial government.[91] - There is no requirement that water contamination or equipment malfunctions be reported to consumers. - There is no requirement for the preparation of a public right-to-know report.
Northwest Territories	- Routine water testing results must be reported to the territorial government.[92] - There is no requirement that water contamination or equipment malfunctions be reported to consumers. - There is no requirement for the preparation of a public right-to-know report.
Nova Scotia	- Routine water testing results must be reported to the provincial government, as do specific water quality concerns.[93] - Nova Scotia's guidelines also contain directions for issuing boil water alerts, but these are not legally binding.[94] - There is no requirement for the preparation of a public right-to-know report.
Nunavut	- Routine water testing results must be reported to the province.[95] - There is no requirement that water contamination or equipment malfunctions be reported to consumers. - There is no requirement for the preparation of a public right-to-know report.
Ontario (pre-	- No required reporting of testing results

[91] *Potable Water Regulation, supra* note 33, ss. 5-10.
[92] *Public Water Supply Regulation, supra* note 20, ss. 9 and 11-13.
[93] *Water and Wastewater Facility Regulation, supra* note 35, ss. 16 and 17.
[94] *Guidelines for Monitoring Public Drinking Water Supplies, supra* note 35.
[95] *Public Water Supply Regulation, supra* note 20, ss. 9 and 11-13.

Walkerton)	or water quality threats. - Public notification is not required.
Ontario (post-Walkerton)	- Routine water testing results must be reported to the provincial government, as do cases of suspected contamination.[96] - Public notification of microbiological threats is required.[97] - Water treatment facilities must make available for inspection by the public all testing results and approvals.[98] - Right-to-know reports must be prepared on a quarterly basis.[99]
P.E.I.	- None
Quebec	- Laboratories must report to the Minister of the Environment the results of the analyses of water samples within a specified time period.[100] - Laboratories must inform the Minister of the Environment and the operator of a water system when water quality parameters have been violated (no immediate notification for violations of organic substances).[101] - There is no requirement for the preparation of a public right-to-know report.
Saskatchewan	- Routine water test results are reported at the request of the provincial government and water suppliers must report violations of contaminant standards to government. Water suppliers must notify the public when contaminant standards are exceeded three times in 30

[96] *Potable Water Regulation, supra* note 26, ss. 7(10) and 8.
[97] *Potable Water Regulation, supra* note 26, s. 10.
[98] *Potable Water Regulation, supra* note 26, s. 11.
[99] *Potable Water Regulation, supra* note 26, s. 12.
[100] *Regulation Respecting the Quality of Drinking Water, supra* note 39, s. 33.
[101] *Regulation Respecting the Quality of Drinking Water, supra* note 39, s. 35.
[102] *Water Pollution Control and Waterworks Regulation, supra* note 43, s. 24 and 25.

	days.[102] - Water suppliers must promptly notify users of the system if e.coli of fecal coliform bacteria are detected.[103] - There is no requirement for the preparation of a right-to-know report.
Yukon	- Routine testing results and violations of water quality standards must be reported to territorial officials.[104] - There is no requirement for the preparation of a right-to-know report.

G. Regulatory Supervision

Occasional inspection and water sampling by provincial or territorial officials is essential for identifying potential problems. These inspections cannot replace the regular system of monitoring that must be in place at the water supply facility, but they are an important addition to a good water protection regime. Other mechanisms, such as the power of provincial regulators to order corrective measures or perform the work themselves and recover costs, offer another essential level of protection. Such orders may extend to requiring water suppliers to have back-up water treatment equipment on hand in the event of a breakdown in the main system.

Virtually all provinces that we surveyed gave provincial or territorial agencies the right to conduct sampling or inspections and allowed government officials to require corrective actions to protect drinking water safety. The adequacy of provincial and territorial efforts depends upon the vigilance with which officials approach their jobs, an issue beyond the scope of our survey. For example, any province or territory could issue boil water alerts, but the number of boil water alerts per year ranges from zero in some jurisdictions to several hundred per year in others.[105] It is unlikely that this range could be

[103] *Regulation Respecting the Quality of Drinking Water*, *supra* note 39, s. 36.

[104] Correspondence of Yukon Environmental Health Services, Sept. 11, 2000.

[105] In our initial telephone surveys, we asked jurisdictions how many boil water alerts had been issued in 1999. Several provinces (Manitoba, Newfoundland, New Brunswick, Nova Scotia, Ontario and Quebec) informed us that records were not kept. Of the provinces providing numbers, the breakdown is as follows: Alberta – 4; British Columbia – 209; Northwest Territories – 2; Nunavut – 0; Prince

completely explained by a lack of water quality problems in some jurisdictions and low quality water in others.

Whether or not a government requires the development of plans to deal with drinking water quality emergencies, and whether water suppliers are required to keep back-up parts or entire treatment works on hand to address equipment failures, varies with the province or territory. Two jurisdictions, B.C. and Nova Scotia, require the preparation of emergency plans. Seven jurisdictions, Alberta, Manitoba, New Brunswick, N.W.T., Nova Scotia, Nunavut and Quebec require at least some back-up parts to be kept on hand for water treatment facilities.

In the U.S., the regulatory presence of state and federal agencies is enhanced by the provision of the "right-to-sue" to water consumers. Under the *Safe Drinking Water Act*, citizens may file lawsuits in response to violations of water standards and protections.[106] The *Act* does require a 60 day notice period in order to encourage voluntary action on the part of the violator.

V. RECOMMENDATIONS

Based on our research, it is our view that a safe drinking water supply requires a number of regulatory or legislative components, most of which are currently in place in one or more of the jurisdictions reviewed by us, but nowhere are all of them incorporated into one superior model. The fundamental paradigm shift that must occur to ensure safe drinking water requires that we view water protection as the underlying obligation of all those who might affect the quality of water in any way at any time. From this perspective, all regulation of land use, waste disposal into air, land or water, collection of water for human use, and distribution of that water, must specifically ensure that potential and actual contamination of water is avoided.

The following recommendations outline the necessary elements of a safe drinking water regime. The recommendations are set out in terms of the elements, and

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Edward Island – 2; Saskatchewan – 1; and Yukon – 0. We have made no attempt to verify this information.

[106] *Safe Drinking Water Act, supra* note 13, §1449.

do not address the legislative and regulatory reform that will be required to implement them, recognizing that the precise mechanisms for implementation require some flexibility.

1. **Source Protection:** Ontario must have mandatory protection for watersheds and wellfields that supply drinking water. This protection must include a mandatory designation of the land areas that influence water quality as well as an assessment of all existing and potential risks to drinking water quality. Representatives must be appointed for every watershed and wellfield, and these representatives should have authority to fully participate in government decisions about land use activities that may affect the watershed or wellfield. Land use, waste management and industrial activity laws, regulations and permits must be amended to ensure the protection of these areas.

2. **Legal Standards:** Ontario should incorporate or improve upon the *Guidelines for Canadian Drinking Water Quality*, through clear legal requirements that:

    - contain standards for all contaminants known to pose either short- or long-term risks to public health, based on the best available science worldwide;
    - set those standards at levels sufficient to protect short- and long-term public health and ensure a margin of safety by applying the precautionary principle; and
    - require regular, periodic review of the list of known contaminants and the standards for them.

3. **Training:** Ontario must require all operators of public water systems to be trained and certified in a manner that ensures that they possess sufficient knowledge and expertise to ensure safe drinking water. Upgraded training and re-certification must also be required for water system operators on a regular and period basis.

4. **Reporting and Right to Know:** Ontario must ensure stringent reporting requirements of test results. The testing lab or personnel and the water supplier must be required to report immediately to the provincial authority, the medical officer of health and the public, every test result that is below standard. Right-to-know

provisions for water consumers recently enacted must be maintained and enforced.

5. **Citizens Right to Enforce:** Ontarians should be given the legislative right to enforce drinking water standards and protections in the courts.

6. **Testing:** Ontario must require testing, at appropriate frequencies, for all contaminants listed in the *Guidelines for Canadian Drinking Water Quality*. An exemption provision that reduces the frequency of testing could be made under appropriate circumstances (*e.g.* where there is a history of clean tests and there are no ongoing human activities that could affect drinking water quality), but periodic complete testing must continue to ensure no change in circumstances over the long-term.

7. **Laboratories Accredited:** All water testing must be performed at accredited labs, or, when testing is performed by the water supplier, by accredited personnel.

8. **Disinfection:** Disinfection should be required for all public water supplies. Ontario should establish a program for the examination of disinfection methods other than chlorine, and the implementation of these alternative methods where applicable.

9. **Filtration:** Filtration must be required for all surface water supplies and groundwater supplies subject to the influence of surface waters.

10. **Facilities:** Ontario should enact binding standards for the design, materials, construction and operation of drinking water treatment facilities and distribution systems.

11. **National Cooperation:** Ontario should take the leading role in the development of federal/provincial/territorial working groups for the evaluation and sharing of contaminant standards, testing, reporting, treatment and distribution for drinking water.

12. **Random Sampling:** Ontario should develop and conduct a program for random sampling and inspection, with clear follow-up actions required in cases of non-compliance.

13. **Emergency Response Plan:** Ontario should require that each public water supplier prepares and provides to the appropriate ministry, and to the public, plans to deal with water quality emergencies.