

Small Drinking Water Systems Risk Assessment Guideline, 2018

Population and Public Health Division,
Ministry of Health and Long-Term Care

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Preamble

The Ontario Public Health Standards: Requirements for Programs, Services, and Accountability (Standards) are published by the Minister of Health and Long-Term Care under the authority of section 7 of the *Health Protection and Promotion Act* (HPPA) to specify the mandatory health programs and services provided by boards of health.^{1,2} The Standards identify the minimum expectations for public health programs and services. Boards of health are accountable for implementing the Standards including the protocols and guidelines that are referenced in the Standards. Guidelines are program and topic-specific documents which provide direction on how boards of health shall approach specific requirement(s) identified within the Standards.

Overview

The Ministry of Health and Long-Term Care (the ministry) oversees the *Small Drinking Water Systems Regulation* under the *Health Protection and Promotion Act* (HPPA).^{2,3} This regulation sets out the requirements that must be followed by the owners and operators of each small drinking water system (SDWS), such as minimum water testing for *Escherichia coli* and total coliforms.³ Owners and operators of SDWS are responsible for keeping drinking water safe and meeting their regulatory requirements.

Under the SDWS Regulation, public health inspectors (PHIs) are responsible for conducting site-specific risk assessments of every SDWS in the province.³ Based on the assessment, PHIs determine what owners and operators must do to keep their drinking water safe and issue a directive for each system, which may include requirements such as water testing, treatment and training. This reflects the use of a customized approach for each SDWS depending on the level of risk, rather than a set of “one-size-fits-all” requirements.

Purpose

The purpose of this document is to provide guidance to boards of health and, in particular, to PHIs, in developing and issuing directives to owners of SDWS in accordance with section 7 of the SDWS Regulation.³ The site-specific requirements outlined in the directives are in addition to the minimum requirements specified in the SDWS Regulation under the HPPA.^{2,3}

This document is not intended to provide legal advice or to be a substitute for the professional judgment of public health inspectors. Public health inspectors should consult with legal counsel as appropriate when issuing directives to owners of Small Drinking Water Systems.

Reference to the Standards

This section identifies the standards and requirements to which this guideline relates.

Safe Water

Requirement 1: The board of health shall:

- a) Conduct surveillance of:
 - Drinking water systems and associated illnesses, risk factors, and emerging trends;
 - Public beaches and water-borne illnesses associated with recreational water, risk factors, and emerging trends; and
 - Recreational water facilities;
- b) Conduct epidemiological analysis of surveillance data, including monitoring of trends over time, emerging trends, and priority populations; and
- c) Use the information obtained to inform safe water programs and services in accordance with the *Infectious Diseases Protocol, 2018* (or as current); the *Population Health Assessment and Surveillance Protocol, 2018* (or as current); the *Recreational Water Protocol, 2018* (or as current); the *Safe Drinking Water and Fluoride Monitoring Protocol, 2018* (or as current); and the *Small Drinking Water Systems Risk Assessment Guideline, 2018* (or as current).

Requirement 3: The board of health shall ensure the availability of education and training for owners/operators of small drinking water systems and recreational water facilities in accordance with the *Operational Approaches for Recreational Water Guideline, 2018* (or as current); the *Recreational Water Protocol, 2018* (or as current); the *Safe Drinking Water and Fluoride Monitoring Protocol, 2018* (or as current); and the *Small Drinking Water Systems Risk Assessment Guideline, 2018* (or as current).

Requirement 6: The board of health shall inform the public about unsafe drinking water conditions and provide the necessary information to respond appropriately in accordance with the *Safe Drinking Water and Fluoride Monitoring Protocol, 2018* (or as current) and the *Small Drinking Water Systems Risk Assessment Guideline, 2018* (or as current).

Requirement 8: The board of health shall ensure 24/7 availability to receive reports of and respond to:

- a) Adverse events related to safe water, such as reports of adverse drinking water of drinking water systems, governed under the *Health Protection and Promotion Act* or the *Safe Drinking Water Act, 2002*;
- b) Reports of water-borne illnesses or outbreaks;
- c) Safe water issues arising from floods, fires, power outages, or other situations that may affect water safety; and
- d) Safe water issues relating to recreational water use including public beaches in accordance with the *Infectious Diseases Protocol, 2018* (or as current); *Operational Approaches for Recreational Water Guideline, 2018* (or as current); the *Recreational Water Protocol, 2018* (or as current); the *Safe Drinking Water and Fluoride Monitoring Protocol, 2018* (or as current); and the *Small Drinking Water Systems Risk Assessment Guideline, 2018* (or as current).

1. Risk Assessment Process

The public health approach to protecting drinking water is based on assessing and identifying potential risks associated with a SDWS. Following a risk assessment, basic requirements are set to assist the owner/operator in adequately maintaining and supervising the provision of drinking water. As described in the *Safe Drinking Water and Fluoride Monitoring Protocol, 2018* (or as current),⁴ the activities which must be conducted as part of the risk assessment process of a small drinking water system include: Conduct a site-specific visit of the small drinking water system;

- Use the most current version of the ministry-approved risk categorization (RCat) tool in accordance with any ministry instructions relating to that version;
- Assign a risk category of “high”, “moderate” or “low” for each system;
- Issue a written directive to the owner of each system outlining the site-specific requirements for the system following an initial risk assessment; and
- Issue a written amendment to a directive to the owner of each system outlining the site-specific requirements for the system following any subsequent inspection of the system, where deemed necessary.⁴

As part of the risk assessment process, other activities may include:

- Collecting water samples, as deemed necessary;
- Reviewing the system’s past water sampling history; and
- Maintaining water sampling records.

The board of health shall ensure that the following approach is used in the assessment of Small Drinking Water Systems. This includes:

- a) Using the Risk Categorization (RCat) Tool to assess SDWS;
- b) Determining the appropriate water treatment actions that are necessary under specific conditions;
- c) Sampling and testing requirements for operators;
- d) Conducting operational checks;
- e) Posting of warning signage;
- f) Requesting records; and
- g) Providing training to owners/operators of SDWS.

1.1 Content and Format of Directives

Directives must include, at minimum, the following sections:

- Name and address of owner (i.e., sufficient for serving of legal notices);
- Location and legal description of the small drinking water system;
- Reason for the directive;
- Risk category;
- Notice of the right to a review by the local medical officer of health and process for requesting such a review in accordance with Section 38 of the SDWS Regulation;

- Notice of penalty for non-compliance;
- Date and location of service; and
- Signature of public health inspector.³

The directive may be organized in the following format:

- Part 1 – Risk Assessment Process
- Part 2 – Treatment Equipment
- Part 3 – Sampling and Testing
- Part 4 – Operational Checks
- Part 5 – Posting of Warning Signage
- Part 6 – Records
- Part 7 – Operator Training

1.2 Risk Categorization (RCat) Tool

The Risk Categorization (RCat) tool was developed by the ministry specifically for site-specific risk assessments of small drinking water systems. The tool is intended to assist PHIs in conducting on-site risk assessments for the purposes of determining whether SDWS are operating in a manner which provides safe water. The RCat tool is comprised of a series of questions which identify the security of the water source and system, and results in risk ratings of the source of water, treatment system and distribution system. It has been designed to consider all parts of the SDWS from source water to consumer, using a multi-barrier approach to protecting drinking water.

The ratings are used to assign one of following risk categories for the system:

- High = Significant level of risk
- Moderate = Medium level of risk
- Low = Negligible level of risk

2. Water Treatment

The requirements for water treatment are based on the findings of the risk assessment and inspection process, the possibility of contamination in the source water and a history of water test results. This section describes the water treatment actions which are required in each situation to ensure the safety of the drinking water supply.

2.1 Secure Ground Water Source

For small drinking water systems that provide drinking water that is derived from a secure ground water source, and where the water sampling and testing results indicate a condition of 0 total coliforms per 100 millilitres and no *Escherichia coli*, for multiple samples, treatment may not be required.

2.2 Ground Water Source

For small drinking water systems that use a ground water source that may contain bacteria and viruses but is not likely to contain cysts or oocysts, the necessary actions are to:

- a) Provide filtration or other treatment necessary to allow for proper functioning of the disinfection equipment or disinfection chemical; and/or
- b) Provide disinfection using either disinfecting equipment or disinfection chemicals that would normally result in providing water that, when sampled and tested, have no total coliforms and no *Escherichia coli*.

2.3 Ground and Surface Water Source

For small drinking water systems that use a ground water source that may contain bacteria, viruses, cysts or oocysts and surface water is suspected of entering the well, the necessary actions are to:

- a) Provide filtration that is designed to be capable of achieving at all times at least 99 per cent removal or inactivation of *Cryptosporidium* oocysts, at least 99.9 per cent removal or inactivation of *Giardia* cysts and at least 99.99 per cent removal or inactivation of viruses; and/or
- b) Provide filtration or other treatment as necessary to remove water contaminants or chemicals to allow for proper functioning of the disinfecting equipment or disinfection chemical; and/or
- c) Provide disinfection using either disinfecting equipment or disinfection chemicals that would normally result in providing water that, when sampled and tested, have no total coliforms and no *Escherichia coli*.

2.4 Surface Water Source

For small drinking water systems that use a surface water source that may contain bacteria, viruses, cysts or oocysts, the necessary actions are to:

- a) Provide filtration that is designed to be capable of achieving at all times at least 99 per cent removal or inactivation of *Cryptosporidium* oocysts, at least 99.9 per cent removal or inactivation of *Giardia* cysts and at least 99.99 per cent removal or inactivation of viruses; or
- b) Provide other water treatment if the owner/operator can provide evidence that the equipment is designed to be capable of producing water of equal or better quality than described in a) above.

If applicable, the owner/operator may also have to:

- a) Provide filtration or other treatment as necessary to remove water contaminants or chemicals to allow for proper functioning of the disinfecting equipment or disinfection chemical; and/or

- b) Provide disinfection using either disinfecting equipment or disinfection chemicals that would normally result in providing water that, when sampled and tested, have no total coliforms and no *Escherichia coli*.

2.5 Point of Entry or Point of Use

Where point of entry or point of use treatment devices are used in addition to treatment outlined in section 2.2 to 2.4, the necessary actions are to:

- a) Filter and disinfect as necessary to ensure that the water being treated by the point of entry or point of use treatment equipment will be capable of providing water that, when sampled and tested, will have no total coliforms and no *Escherichia coli*. This may include the provision of filtration that is designed to be capable of achieving at all times at least 99 per cent removal or inactivation of *Cryptosporidium* oocysts, at least 99.9 per cent removal or inactivation of *Giardia* cysts and at least 99.99 per cent removal or inactivation of viruses. and/or
- b) Provide filtration or other treatment as necessary to remove water contaminants or chemicals to allow for proper functioning of the disinfecting equipment or disinfection chemical.

2.6 Distribution System

- a) For small drinking water systems that provide water through distribution piping, the necessary actions are to have the water treated with a disinfectant that would provide a residual of that disinfectant in accordance with the requirements for secondary disinfection in Section 14(1) 4 of the SDWS Regulation.³
- b) Where a distribution system serves less than 10 connections, secondary disinfection may not be required if:
 - Access to the drinking water is sufficiently restricted; and
 - Sampling is done at a frequency in accordance with Tables 2 and Table 3.

2.7 Other Sources

For small drinking water systems that use other sources (e.g., hauled water), treatment requirements are to be used in accordance with sections 2.1 to 2.4.

2.8 NSF/ANSI 55 Class A UV Systems

For small drinking water systems that use NSF/ANSI 55 Class A UV Systems that have a built-in fail-safe design that terminates the discharge of water if the system is not performing to the NSF standard, the frequency of testing required as per Table 2 may be reduced by up to 50%.*

*The enhanced safety requirements of NSF/ANSI 55 Class A UV Systems help to reduce sampling requirements as: the manufacturer's performance claims are verified by an independent organization; NSF audits manufacturing, including their quality control and quality assurance, materials and testing procedures; and NSF verifies UV-dose and/or inactivation claims.

3. Sampling and Testing

3.1 Sampling and Testing Requirements for Primary Parameters – Bacteriological

This section will assist in determining the required scheduling of sampling and testing for bacteria (total coliforms and *Escherichia coli*) to be included in a directive where the entire system is not posted. In determining the schedule and frequency of sampling, the following factors shall be considered:

- History of water sampling results;
- Whether the drinking water is provided with treatment;
- Whether the drinking water source is secure ground water, ground water or surface water; and
- The risks identified through use of the RCat tool.

3.2 Sampling History

Where there is a new small drinking water system or where a system has less than one year's history of sampling and testing, it is necessary to take samples at the minimum rate of one sample per month or at a frequency greater than one sample per month as indicated in Table 2 and Table 3.

Table 2: Recommended frequency of bacterial sampling for *Escherichia coli* and total coliforms for all small drinking water systems without testing history

Risk Category	Treatment Provided	Frequency of sampling water after being treated or otherwise directed for consumption
Low	No	One sample every three months
Low	Yes	One sample every three months
Moderate	No	One sample monthly
Moderate	Yes	One sample every two months
High	No	One sample every week
High	Yes	One sample every two weeks

3.3 Sampling Requirements for Distribution Systems

Table 3 is to be used in addition to Table 2 to determine the required frequency of sampling for small drinking water systems with distribution systems.

Table 3: Recommended sampling frequency for systems with distribution systems, by level of risk

Applies to	Secondary Treatment	Number and Frequency of Sampling		
		Low Risk	Moderate Risk	High Risk
2-10 Connections*	Yes or no	One sample monthly	One sample monthly	One sample monthly
11-100 Connections	Yes	One sample monthly	One sample monthly	One sample every two weeks
≥ 101 Connections	Yes	One sample from the treated water supply and one sample for every 100 connections or part thereof from the distribution system monthly	One sample from the treated water supply and one sample for every 100 connections or part thereof from the distribution system every two weeks	One sample from the treated water supply and one sample for every 100 connections or part thereof from the distribution system every week

* “Number of connections” means the number of drinking water access points either single or grouped.

“Access points” means:

- a) Single access point refers to a single standalone access point which may have one or more spouts, such as a drinking water fountain or tap or a trailer park site hook-up.
- b) Grouped access point refers to a system of plumbing within a single building.

Other factors to consider:

Samples are required to be collected at locations where the sampling would be representative of the water quality of the majority of the system.

Unless the PHI provides otherwise, for a system that uses point of entry treatment units and has more than one unit, samples are to be taken from locations downstream of the point of entry treatment units on a rotational basis. The rotation is to be set so that after a sample is taken from a location downstream of a particular point of entry treatment unit, another sample is not taken from that same unit, until samples have been taken from locations downstream of all the other point of entry treatment units.

3.4 Sampling and Testing Requirements for Secondary Parameters – Chemical or Radiological

For any water supply where a chemical or radiological agent is suspected, further assessment of the potential sources of the contaminant and additional testing for the suspected chemical or radiological agent is required.

However, where testing results indicate that the level of chemical or radiological agent is below the limits in the Ontario Drinking Water Quality Standards or where the contaminants are naturally occurring and not expected to increase, no further sampling is required of the small drinking water system. Appropriate notification of users of the conditions of the drinking water must be provided.

Where contaminants are identified and have the potential to fluctuate in a manner that may cause an increased risk to the health of the users, a schedule for regular sampling and testing is required. This information provides surveillance data to monitor any potential increased risk to the users of the water supply.

4. Operational Checks

Where filtration is to be used on a system, turbidity is to be tested at a frequency in accordance with the risk level and configuration of the system.

Where primary or secondary disinfection is to be used, the chlorine residual is to be tested at a frequency of once every 24 hours or adjusted in accordance with the risk level and configuration of the system.

5. Posting of Warning Signage (Posted System)

Subsection 7 (6) of the SDWS Regulation provides that directives may require the posting and maintenance of warning signs.³ Direction may be given which requires the placement of a sign that states: "Public Notice: Do not drink this water" when posting the entire small drinking water system or specific service connections. The owner/operator should be informed that they are expected to conduct routine checks to confirm signs continue to be posted, in a good state of repair and they are easily readable.

6. Records

Subsection 10 (2) of the SDWS Regulation requires that records of maintenance and operational tests be made available to the PHI on request.³ The PHI may request additional records as deemed necessary.

7. Training

Training for operators is important because it ensures they are aware of their responsibilities under the regulations and are able to maintain the supply of safe water to users.

At a minimum, training must include awareness of the normal operation of the system in order to respond appropriately to adverse test results or other conditions that may affect the safety of the drinking water. Table 4 describes the minimum recommendations for core competencies and training requirements for operators of different types of systems.

Table 4: Operator Training in Core Competencies

Knowledge Areas	System Source and Treatment Type				
	Posted System (Signage)	Secure Groundwater (no treatment required)	Ground Water and/or Surface Water (UV light, filtration* and chemical disinfection)	Distribution System (secondary disinfection)	Other Sources (e.g. water haulage vehicle)
	<i>Recommended Courses (based on knowledge areas)**</i>				
	<i>Educational Materials Only</i>	<i>Intro Course for 319 (online or half day)</i>	<i>Basics for 319 or equivalent</i>	<i>Advanced for 319 or equivalent</i>	<i>Educational Materials Only</i>
Knowledge of general protection requirements (notification of users).	✓				✓
Knowledge of ground water basics, well basics, best management practices.		✓			
Knowledge of general protection requirements (water source, source water protection issues, potential of system failure, impacts of system failure, notification of users).			✓	✓	

Knowledge Areas	System Source and Treatment Type				
	Posted System (Signage)	Secure Groundwater (no treatment required)	Ground Water and/or Surface Water (UV light, filtration* and chemical disinfection)	Distribution System (secondary disinfection)	Other Sources (e.g. water haulage vehicle)
	<i>Recommended Courses (based on knowledge areas)**</i>				
	<i>Educational Materials Only</i>	<i>Intro Course for 319 (online or half day)</i>	<i>Basics for 319 or equivalent</i>	<i>Advanced for 319 or equivalent</i>	<i>Educational Materials Only</i>
Knowledge of proper sampling techniques and lab submission process (why the sample is taken, where it is to be taken, when and who to call if an adverse result/observation happens, what the sample results mean).		✓	✓	✓	
Ability to operate and understand why and how the treatment equipment works and what to do if the treatment fails.			✓	✓	
Ability to maintain the operation of the equipment to, at minimum, manufacturer's recommended instructions.			Required if the system is not supported by a service company with appropriately trained staff		
Knowledge of distribution systems (how to sample, maintenance, and manage what to do if a distribution system breaks).				✓	

* Where filtration is required for chemical or radiological parameters, the PHI should determine if additional training is required for the adequate operation of the system.

** Operators must take training in order to obtain the required knowledge to operate their SDWS. This includes courses offered/recommended by a manufacturer of treatment devices or by the public health unit; MOECC courses; courses offered through local community colleges, professional associations or private providers; and/or government agency training courses.

Additional Resources

1. Walkerton Clean Water Centre (WCWC) [Internet]. Toronto, ON: Queen's Printer for Ontario; c2011 [cited 2018 Jan 8]. Available from: <https://www.wcwc.ca>
2. Ontario Water Works Association (OWWA) [Internet]. Toronto, ON: Ontario Water Works Association; c2018 [cited 2018 Jan 8]. Available from: <https://www.owwa.ca/>

3. Fleming College [Internet]. Peterborough, ON: Sir Sandford Fleming College; c2018 [cited 2018 Jan 8]. Available from: <https://flemingcollege.ca/>
4. Conestoga College [Internet]. Kitchener, ON: Conestoga College; c2018 [cited 2018 Jan 8]. Available from: <http://www.conestogac.on.ca/>

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1. Ontario. Ministry of Health and Long-Term Care. Ontario public health standards: requirements for programs, services and accountability. Toronto, ON: Queen's Printer for Ontario, 2018. Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/default.aspx
2. *Health Protection and Promotion Act*, RSO 1990, c H.7. Available from: <https://www.ontario.ca/laws/statute/90h07>
3. *Small Drinking Water Systems*, O Reg 319/08. Available from: <https://www.ontario.ca/laws/regulation/080319>
4. Ontario. Ministry of Health and Long-Term Care. Safe drinking water and fluoride monitoring protocol, 2018. Toronto, ON: Queen's Printer for Ontario, 2018. Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/protocolsguidelines.aspx

