

Guidelines for Monitoring Public Drinking Water Supplies

Part I – Municipal Public Drinking
Water Supplies



Contents

1. Introduction	1
1.1 Purpose	1
1.2 Authority	1
1.3 Application	2
2. Roles and Responsibilities	2
2.1 Municipal Drinking Water Supply Owner (Owner)	2
2.2 Nova Scotia Environment (NSE)	2
2.3 Medical Officer of Health (MOH)/Environmental Health Consultant (EHC) ..	3
2.4 Water Quality Lab (Lab)	3
3. Monitoring for Microbiological Quality	3
3.1 Routine Monitoring - Total Coliform and Escherichia coli (<i>E. coli</i>)	3
3.1.1 Sample Frequency, Number and Location	4
3.1.2 Sample Collection and Preservation	4
3.1.3 Reporting of Sample Results	5
3.2 Enteric Viruses	5
3.3 Enteric Protozoa	5
3.4 Microbial Particulate Analysis (MPA)	6
3.5 Compliance – Microbiological Parameters	6
4. Corrective Actions to be Taken When Bacteria Are Present	7
4.1 Immediate Notification	7
4.2 Procedure for Responding to the Presence of Coliform Bacteria During Routine Monitoring	7
4.2.1 Total Coliforms Present, <i>E. coli</i> Absent	9
4.2.2 <i>E. coli</i> Present at a Single Location	9
4.2.3 <i>E. coli</i> Present at Multiple Locations	10
4.3 Conducting an Investigation	11
5. Boil Water Advisories	12
5.1 Deficiencies that Require a Boil Water Advisory	12

Approved by: Frances Martin, Deputy Minister, Nova Scotia Environment

Effective date: April 1, 2020

Version control: Replaces the December 12, 2005 version

5.2	Deficiencies That May Require a Boil Water Advisory	13
5.3	Boil Water Advisory – Initiated by NSE	13
5.4	Boil Water Advisory Protocol and Communication Plan	13
5.4.1	Initiating the Advisory	13
5.4.2	Procedure for Public Notification	14
5.4.3	Suggested Wording	15
5.4.4	Follow up Communication Plan	15
5.4.5	Instructions for Boiling and Disinfecting Tap Water	15
5.5	Removing the Boil Water Advisory	16
6.	Monitoring for Chemical, Physical and Radiological Quality	16
6.1	General Chemical and Physical Water Quality Parameters	16
6.1.1	Sample Frequency, Number and Location	17
6.2	Health-Related Parameters – <i>Guidelines for Canadian Drinking Water Quality</i>	17
6.3	Radionuclides	18
6.4	Disinfection By-Products	18
6.4.1	Trihalomethanes (THMs)	18
6.4.2	Haloacetic Acids (HAAs)	18
6.4.3	Chlorate	19
6.4.4	Chlorite	19
6.4.5	Bromate	19
6.4.6	N-Nitrosodimethylamine (NDMA)	19
6.5	Manganese	20
6.6	Cyanobacterial Toxins	21
6.7	Sample Collection and Preservation	23
6.8	Reporting of Sample Results	23
6.9	Re-sampling Procedure	24
6.10	Compliance – Chemical, Physical and Radiological Parameters	24
7.	Corrosion Monitoring Program	25
7.1	Corrosion Assessment Monitoring Requirements	25
7.1.1	Corrosion Assessment - Distribution System Monitoring	27
8.	Source Water Protection Monitoring	27
9.	Operational Monitoring	28
9.1	Turbidity	28

9.2	Primary Disinfection	28
9.3	Secondary Disinfection	29
9.4	Fluoride	29
9.5	Aluminum	29
9.6	Free Ammonia, Nitrate and Nitrite	30
10.	Corrective Actions to be Taken when a Sample Exceeds a Health-Related Chemical Parameter	30
11.	Do Not Consume and Do Not Use Advisories	31
11.1	Do Not Consume or Do Not Use Advisory Protocol and Communication Plan	32
11.1.1	Initiating the Advisory	32
11.1.2	Procedure for Public Notification	32
11.1.3	Suggested Wording	33
11.1.4	Follow up Communication Plan	33
11.2	Removing the Do Not Consume or Do Not Use Advisory	34

List of Appendices

Appendix A

Sample Collection and Preservation - Microbiological Quality	35
--	----

Appendix B

The Growth of Biofilm in a Water Works System	37
---	----

Appendix C

Draft Media Releases for Water Advisories	38
---	----

Appendix D

Instructions for Boiling and Disinfecting Tap Water During a Boil Advisory	39
--	----

Appendix E

Users That Must Take Particular Precautions During A Boil Advisory	40
--	----

Appendix F

Summary Operational Procedures for Municipal Supplies Health-Related Chemical and Radiological Exceedance	45
--	----

1. Introduction

1.1 Purpose

The purpose of these *Guidelines* is to assist the owner¹ (Approval Holder) of a municipal public drinking water supply with developing and implementing an acceptable water quality monitoring program.

The objective is to ensure that consumers of water provided by a municipal drinking water supply in Nova Scotia have safe drinking water. Systematic water quality monitoring, immediate notification and corrective action are essential elements to a comprehensive water supply protection program.

Owners of municipal drinking water supplies shall use these *Guidelines* to develop and implement a water quality monitoring program that supports the maintenance and optimization of water system operations.

1.2 Authority

Regular Testing - Section 33 of the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations requires an owner of a public drinking water supply to regularly monitor drinking water quality for the parameters listed in the *Guidelines for Monitoring Public Drinking Water Supplies*, as well as other substances as may be required by the Minister or an Administrator. Samples are to be collected in the manner and with the frequency set out in the *Guidelines for Monitoring Public Drinking Water Supplies* or as required by the Minister or an Administrator.

Drinking water quality testing is to be completed by approved laboratories in accordance with Nova Scotia Environment's *Policy on Acceptable Certification of Laboratories*, as amended from time to time.

Immediate Notification and Corrective Action - Section 34 of the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations requires an owner of a public drinking water supply to:

- notify the department immediately upon becoming aware of not meeting health-related drinking water quality criteria; and
- take corrective action as set out in the *Guidelines for Monitoring Public Drinking Water Supplies* or as may be required by the Minister or Administrator.

¹ The word owner used in this document means the Approval Holder.

Provision of Safe Drinking Water - Section 35 of the Water and Wastewater Facilities and Public Drinking Water Supplies *Regulations* requires that an owner of a public drinking water supply ensure that the microbiological, physical and chemical characteristics of a public drinking water supply do not exceed the maximum acceptable concentration (MAC)² for substances listed in the most recent version of Health Canada's *Guidelines for Canadian Drinking Water Quality*, as amended from time to time.

1.3 Application

These *Guidelines* apply to municipal public drinking water supplies. Municipal supplies are issued approvals under the Activities Designation Regulations and are referred to as approved drinking water supplies. It should be noted that any terms and conditions in an operating approval will always take precedence over the requirements in these *Guidelines*.

2. Roles and Responsibilities

2.1 Municipal Drinking Water Supply Owner (Owner)

An owner is responsible for delivering safe drinking water to the consumer. This responsibility includes routine monitoring of the public drinking water supply, informing the consumer and Nova Scotia Environment (NSE) if water quality fails to meet the health-related criteria set out in the most recent version of the *Guidelines for Canadian Drinking Water Quality* and for taking corrective action to restore drinking water quality. The owner is also responsible for contacting NSE as soon as they become aware of any circumstances that may result in unsafe water being supplied to the consumer such as equipment failure and/or malfunction. The owner shall have contingency plans in place to address poor water quality, major fluctuations in system flows and/or pressure, or a prolonged interruption in the supply of water, etc.

2.2 Nova Scotia Environment (NSE)

NSE has been designated as the lead agency to take such measures as are reasonable to provide access to safe, adequate and reliable water supplies (Environment Act, section 104(c)). To carry out this mandate, NSE issues approvals to construct and operate water distribution and water treatment facilities, classifies facilities, requires certified operators, registers public drinking water supplies, audits facilities and ensures water quality monitoring programs are carried out and appropriate action is taken to address any problems that may arise. When a public drinking water supply owner fails to notify consumers that a public health risk exists, NSE will issue a water advisory.

² A maximum acceptable concentration (MAC) means the health-related criteria specified for substances in the most recent version of Health Canada's *Guidelines for Canadian Drinking Water Quality*, which when present above the set concentration have known or suspected adverse health effects.

2.3 Medical Officer of Health (MOH)/Environmental Health Consultant (EHC)

The MOH provides advice to the Minister of Environment, the owner, NSE and the public regarding public health concerns associated with drinking water supplies. This advice may also come from an EHC, within NSE, working in collaboration with the MOH.

2.4 Water Quality Lab (Lab)

The lab conducts analyses of drinking water samples following procedures defined in the latest edition of the *Standard Methods for the Examination of Water and Wastewater*, published jointly by the American Public Health Association, the American Water Works Association and the Water Environment Federation, or an alternative method acceptable to NSE. The lab also participates in quality control, quality assurance and accreditation programs, as required, to ensure accurate results. All sample analyses are to be performed by a laboratory acceptable to NSE in accordance with the *Policy on Acceptable Certification of Laboratories*.

3. Monitoring for Microbiological Quality

3.1 Routine Monitoring - Total Coliform and Escherichia coli (*E. coli*)

An owner shall monitor the municipal drinking water supply for total coliforms and *E. coli* bacteria. Coliform bacteria (total or *E. coli*) are indicator organisms used to determine the efficacy of treatment and the integrity of the waterworks system. They are surrogates for less abundant and more difficult to detect human pathogens.

An owner shall ensure that samples are tested for the presence of total coliform and *E. coli* bacteria using methods listed in the latest edition of *Standard Methods for the Examination of Water and Wastewater*. Routine³ samples may be analyzed using a presence/absence (P/A) method as opposed to a quantitative method. Confirmation sample(s), collected in response to a positive routine sample, shall be analyzed by a quantitative method such as Most Probable Number (MPN) to understand the magnitude of impact to the system.

3 Routine Sample means a water sample collected from the municipal drinking water facility for microbiological, chemical, radiological or physical quality to fulfill sampling requirements stated in the facility's operating approval and these *Guidelines*.

3.1.1 Sample Frequency, Number and Location

The minimum number of total coliform and *E. coli* samples an owner shall collect from the municipal supply is shown in Table 1.

Table 1 – Minimum Number of Bacteria Samples per Month Based on Population Served

Population Served	Minimum Number of Samples per Month*
Up to 5,000	4
5,000 to 90,000	1 per 1,000 persons
More than 90,000	90 + (1 per additional 10,000 persons)

* Owners shall collect samples from the system on a weekly basis to equal the minimum number of samples per month.

At the time of sample collection, the owner shall measure the disinfectant residual and turbidity at each sample location. Sampling frequency from the system shall be at least weekly. Samples must be collected in accordance with the facility's operating approval and approved annual sampling plan.

The sampling locations shall be chosen to be representative of the waterworks system and include central and peripheral locations. In many cases the number of samples necessary to obtain an accurate representation of a waterworks system will exceed these minimums. Buildings with prolonged periods of low or no water use should be avoided as sampling locations.

For systems using surface water supplies, at least one water sample per week shall be collected from the point where the treated water enters the distribution system.

NSE may alter the frequencies, locations, numbers and parameters to be monitored depending on local conditions and analytical results.

3.1.2 Sample Collection and Preservation

All samples for total coliform and *E. coli* bacteria shall be collected and transported to the lab according to the standard procedures outlined in Appendix A. The owner shall record the facility's operating approval number on the lab's sample submission form.

3.1.3 Reporting of Sample Results

An owner shall ensure that results of all samples collected for bacteriological analysis (total coliforms or *E. coli*) are sent from the lab to the owner. An owner shall record summaries of sample results in a uniform manner. The minimum information required in the summary is date, time, location of sample collection, sampler's name, parameter(s), and test result(s). The owner shall maintain records of sample results, including the original lab certificates, for a minimum of two years from the collection date and make them available to NSE upon request.

Whenever the presence of coliforms is detected (total or *E. coli*), the lab shall immediately notify the water supply owner and NSE and forward the results to NSE. The owner shall also immediately notify NSE and forward the results to NSE immediately after they receive the results from the lab. Receipt of any results sent electronically must be confirmed by telephone. If the local NSE office cannot be reached for whatever reason, the owner shall contact the after-hours number at 1-902-893-6347. The after-hours number shall be contacted outside of normal business hours: weekdays – 4:30pm to 8:30am, weekends and holidays.

Upon receipt of sample results indicating the presence of total coliforms or *E. coli*, the owner shall comply with section 4.0 Corrective Action to be Taken When Bacteria Are Present.

If results indicate deficiencies that require or may require a boil water advisory (refer to section 5.1 and 5.2), the owner shall notify and work cooperatively with NSE. NSE will notify the MOH.

3.2 Enteric Viruses

Health Canada has established a health-based treatment goal of a minimum 4-log reduction for enteric viruses based on source water quality. In the event of a suspected or confirmed outbreak, NSE may, in consultation with the MOH, require the owner of a municipal drinking water supply to sample for enteric viruses and provide the laboratory results. As per *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*, all municipal drinking water supplies must provide treatment to achieve a minimum 4-log reduction of enteric viruses.

3.3 Enteric Protozoa

Health Canada has established a health-based treatment goal of a minimum 3-log reduction for *Giardia* and *Cryptosporidium* based on the source water quality. In the event of a suspected or confirmed outbreak, NSE may, in consultation with the MOH, require the owner of a municipal drinking water supply to sample for *Giardia* and *Cryptosporidium* and provide the laboratory results. As per *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*, municipal drinking water systems supplied by surface water or groundwater under the direct influence (GUDI) of surface water must provide treatment to achieve a minimum 3-log reduction for *Giardia* and *Cryptosporidium*.

3.4 Microbial Particulate Analysis (MPA)

Approved drinking water supplies that have been classified as GUDI – Medium Risk shall conduct MPA testing every two years for each individual GUDI well, in the spring and following a rainfall. Any MPA testing shall be completed in accordance with Step 3 of the Protocol for Determining Groundwater Under the Direct Influence of Surface Water.

If the classification of any medium risk GUDI well increases to high, NSE shall be notified immediately and the municipal owner shall take any necessary corrective action.

Table 2 – Microbial Particulate Analysis (MPA) Risk Levels

Risk Level	MPA Score
Low	<10
Medium	10 – 19
High	>20

3.5 Compliance – Microbiological Parameters

An owner shall ensure that the drinking water meets the requirements for microbiological quality as set out in the most recent edition of Health Canada's *Guidelines for Canadian Drinking Water Quality* and the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*.

All municipal drinking water facilities must meet the following:

- *E. coli* – MAC none (0) detectable per 100mL (may be reported as absent or <1);
- Total Coliforms – MAC none (0) detectable per 100mL (may be reported as absent or <1);
- Enteric Viruses – Treatment goal minimum 4-log reduction.

Municipal drinking water supplies that obtain their water from surface water or GUDI sources must also meet the following:

- Enteric Protozoa (*Giardia* and *Cryptosporidium*) – Treatment goal minimum 3-log reduction

As total coliform bacteria are not uniformly distributed in water and are subject to considerable variations in public health significance, this MAC will be applied in Nova Scotia as outlined in section 4.0. When a boil water advisory is necessary, the owner shall comply with section 5.4.

Compliance with treatment goals for viruses and protozoa is determined by monitoring the disinfection (CT⁴/IT⁵) and filtration (turbidity) processes. Information regarding the parameters to be monitored, location and frequency is outlined in the owner's Approval to Operate.

4 CT = Concentration of Chemical Disinfectant (mg/L) X Time (minutes) X Baffling Factor

5 IT (UV Dose) = Ultraviolet Intensity (watts/cm²) X Time (seconds)

4. Corrective Actions to be Taken When Bacteria Are Present

4.1 Immediate Notification

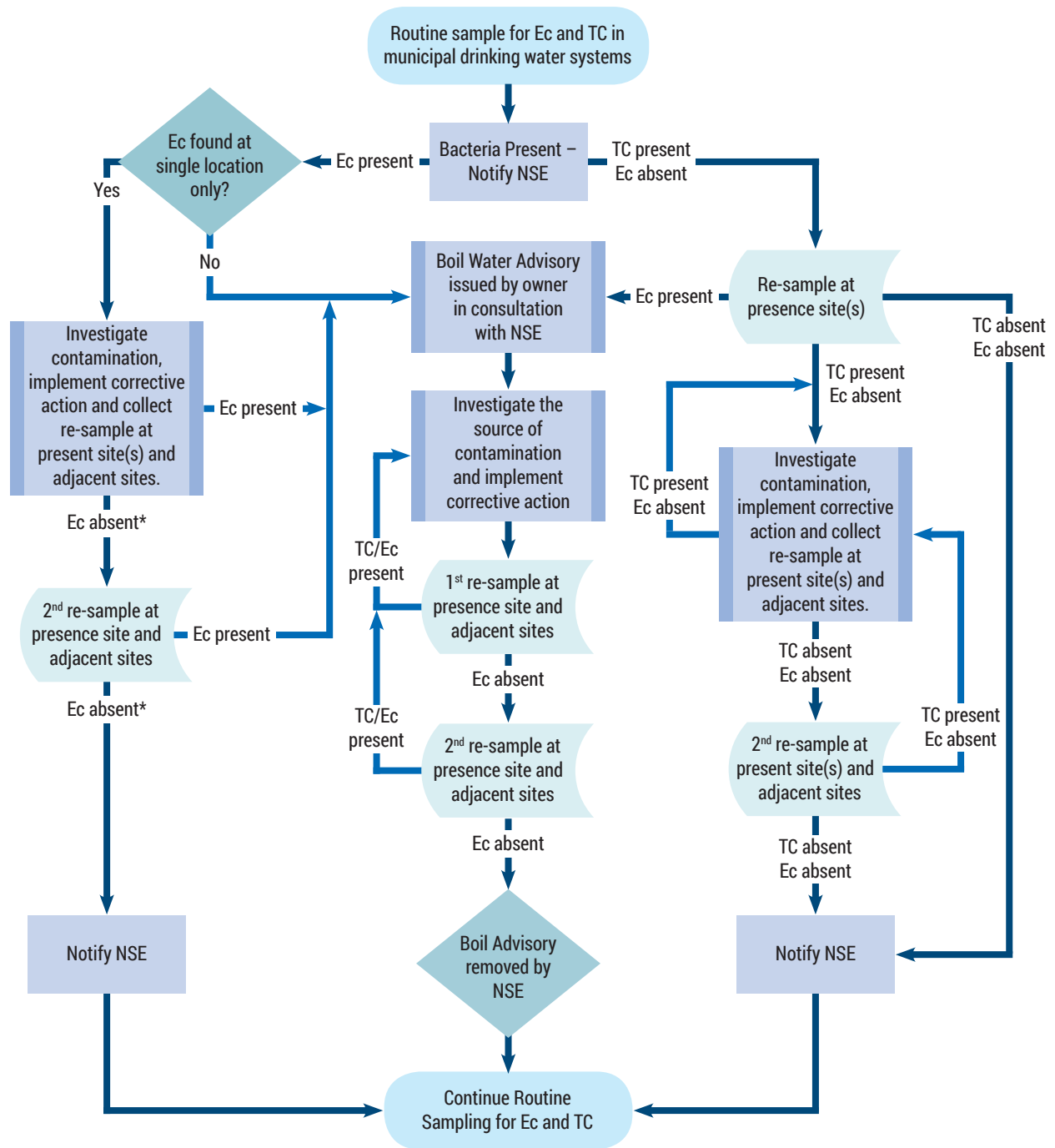
An owner of a municipal water supply shall contact NSE immediately, by telephone, as soon as they receive notification from the lab of any sample result(s) indicating the presence of total coliform or *E. coli* bacteria. The owner shall also forward a copy of the results to NSE. If the owner is not able to speak with a person from the local NSE office directly, the owner shall call the after-hours number at 1-902-893-6347. Receipt of any results sent electronically from the owner to NSE must be confirmed with NSE by telephone. The after-hours number shall be contacted outside of normal business hours: weekdays – 4:30pm to 8:30am, weekends and holidays.

When corrective action is to involve increased sampling and/or weekend/holiday sampling, the owner shall immediately notify the lab and arrange for access to lab services.

4.2 Procedure for Responding to the Presence of Coliform Bacteria During Routine Monitoring

The following section describes the actions required by an owner when routine monitoring shows the presence of total coliforms or *E. coli*. As shown in Figure 1, the response varies based on the type and prevalence of bacteria present in the distribution system. Information in this figure is supplemented with additional information in sections 4 and 5.

Figure 1 – Decision Tree for Responding to the Presence of Bacteria⁶



1. Ec = *E. coli*, TC = Total Coliforms
2. *If a total coliform present sample is detected during re-sampling for a single location *E. coli*, the decision route for detection of a total coliform positive sample, in the absence of *E. coli*, should be followed (right-hand side of the decision tree).

6 Adapted from the Federal-Provincial-Territorial Committee on Drinking Water's Guidance for Issuing and Rescinding Boil Water Advisories in Canadian Drinking Water Supplies (2015, pg.14).

4.2.1 Total Coliforms Present, *E. coli* Absent

If a routine sample is present for total coliform bacteria, in the absence of *E. coli*, the owner shall immediately notify NSE by telephone, and collect a confirmation sample from all locations showing the presence of total coliform bacteria.

The owner shall also measure the disinfectant residual and turbidity at each confirmation sample location.

- If there is inadequate residual at location(s) within the distribution system, increase disinfection dosage and flush water mains, if necessary. **If there is inadequate disinfection of the water entering the distribution system, notify NSE and issue a boil advisory** (refer to section 5)
- If the turbidity is elevated in the distribution system (e.g. not in compliance with approval requirements or higher than normal for a given location), evaluate the effectiveness of treatment and integrity of the transmission/distribution system. Check the turbidity of the water leaving each filter (if present), the turbidity of the water entering and within the distribution system. Determine the potential for a breach in the integrity of the transmission/distribution system (e.g. main break, etc.).

The confirmation sample shall be analyzed by a quantitative method (MPN) to determine the magnitude of contamination (refer to Section 3.1). The owner shall coordinate with the lab to ensure samples are analyzed as soon as they are received.

If a boil advisory was issued, the advisory may be confined only to those residents serviced by the portion of the system affected and not the entire distribution system. This will be determined on a case-by-case basis in consultation with NSE.

4.2.2 *E. coli* Present at a Single Location

If a routine sample is present for *E. coli* bacteria, the owner shall immediately notify NSE, by telephone, upon receiving notification of the sample results from the lab. NSE will notify the MOH.

The owner shall immediately begin an investigation to explain the presence of bacteria (refer to section 4.3) and collect a minimum of three confirmation samples for every location that showed the presence of *E. coli* bacteria. The owner shall immediately notify NSE, by telephone and in writing (e.g. email), of the results of the investigation and take corrective action to restore water quality. The confirmation samples shall be collected from the *E. coli* positive location as well as an upstream and a downstream location. Where possible, upstream and downstream sample locations should be within five active service connections of the sample location that tested positive for *E. coli* bacteria. If no suitable sample collection locations can be found within five service connections, the utility should make every effort to locate alternate upstream and downstream sampling points within the same hydraulic zone as the positive *E. coli* sample. If a positive result is obtained from a dead-end in the distribution system, a minimum of two confirmation samples shall be collected: one from the *E. coli* positive location and one from an adjacent location.

The owner shall also measure the disinfectant residual and turbidity at each confirmation sample location.

- If there is inadequate residual at location(s) within the distribution system, increase disinfection dosage and flush water mains, if necessary. **If there is inadequate disinfection of the water entering the distribution system, notify NSE and issue a boil advisory** (refer to section 5).
- If the turbidity is elevated in the distribution system (e.g. not in compliance with approval requirements or higher than normal for a given location), evaluate the effectiveness of treatment and integrity of the transmission/distribution system. Check the turbidity of the water leaving each filter (if present), the turbidity of the water entering and within the distribution system. Determine the potential for a breach in the integrity of the transmission/distribution system (e.g. main break, etc.).

Confirmation samples shall be analyzed by a quantitative method (MPN) to determine the magnitude of contamination (refer to Section 3.1). The owner shall coordinate with the lab to ensure the samples are analyzed when received.

Depending on the results of the investigation, NSE may require the owner to issue a boil advisory in accordance with section 5.4. The boil advisory may be confined only to those residents serviced by the portion of the system affected and not the entire distribution system. This will be determined on a case-by-case basis in consultation with NSE.

4.2.3 *E. coli* Present at Multiple Locations

If routine sampling indicates the presence of *E. coli* bacteria at multiple sample locations, the owner shall immediately notify NSE, by telephone, upon receiving notification of the sample results from the lab. NSE will notify the MOH.

The owner shall immediately issue a boil water advisory in accordance with section 5.4 and begin an investigation to explain the presence of *E. coli* bacteria as described in section 4.3. Depending on circumstances, the boil advisory may be confined only to those residents serviced by the portion of the system affected and not the entire distribution system. This will be determined on a case-by-case basis in consultation with NSE.

The owner shall immediately notify NSE, by telephone and in writing (e.g. email), of the results of the investigation and take corrective action to restore water quality. The owner shall collect three confirmation samples for every routine sample that showed the presence of *E. coli* bacteria. The confirmation samples shall be collected from the *E. coli* positive locations, an upstream and a downstream location, adjacent to the locations that tested positive. Where possible, upstream and downstream sample locations should be within five active service connections of the sample location that tested positive for total coliform and *E. coli* bacteria. If no suitable locations can be found within five service connections, the utility should make every effort to locate alternate upstream and downstream sampling points within the same hydraulic zone as the positive *E. coli* samples. If a positive result is obtained from a dead-end in the distribution system, a minimum of two confirmation samples shall be collected: one from the *E. coli* positive location and one from an adjacent location.

The owner shall also measure the disinfectant residual and turbidity at each confirmation sample location.

- If there is inadequate residual at location(s) within the distribution system, increase disinfection dosage and flush water mains, if necessary.
- If the turbidity is elevated in the distribution system (e.g. not in compliance with approval requirements or higher than normal for a given location), evaluate the effectiveness of treatment and integrity of the transmission/distribution system. Check the turbidity of the water leaving each filter (if present), the turbidity of the water entering and within the distribution system. Determine the potential for a breach in the integrity of the transmission/distribution system (e.g. main break, etc.).

Confirmation samples shall be analyzed by a quantitative method (MPN) to determine the magnitude of contamination (refer to Section 3.1). The owner shall coordinate with the lab to ensure samples are analyzed as soon as they are received.

4.3 Conducting an Investigation

When a sample shows the presence of *E. coli* bacteria or a confirmation sample confirms the presence of total coliform bacteria, the owner shall immediately begin an investigation to explain the presence of bacteria. In consultation with NSE, the owner shall consider the following on a case-by case basis:

- 1) Assess source water quality
 - a) Determine if there has been a recent inflow of water from a contaminated source;
 - b) Determine if there have been recent changes in source water quality (e.g. fluctuation in turbidity, etc.).
- 2) Evaluate the effectiveness of treatment
 - a) Determine if there been a recent interruption in treatment;
 - b) Determine if disinfection equipment is working properly. Calculate CT/IT to confirm requirements are met;
 - c) Measure the disinfectant residual leaving the plant;
 - d) Determine if the turbidity of water leaving each filter and the turbidity of the water entering the distribution system meets approval requirements;
 - e) Collect samples of water leaving the treatment plant for bacteriological quality;
 - f) Determine if the required log reduction for viruses (i.e. all systems) and protozoa (i.e. systems relying on surface water and GUDI sources) is achieved;

- 3) Evaluate the integrity of the transmission/distribution system
 - a) Determine if water quality has deteriorated due to cross-connections, repairs, construction, loss of pressure, etc.
 - b) When the system was last flushed was anything unusual noted?
 - c) Was the system recently de-pressurized?
 - d) Has there been any recent construction on the system? What is the location and type of recent repair? Were the mains disinfected after the repair?
 - e) Is there a possibility of cross-connection?
 - f) Have there been any water quality complaints?
- 4) Enumerate coliform bacteria in samples to assess the degree of contamination and possible entry point;
- 5) Consider further microbiological analysis of samples collected from the system;
- 6) Review the history of the system and possibility for biofilm formation as per Appendix B.

This list is provided as guidance only. The owner is ultimately responsible for carrying out the investigation to determine the cause of the contamination event. The Owner shall immediately notify NSE, by telephone and in writing (e.g. email), of the results of the investigation and take corrective action to restore water quality.

5. Boil Water Advisories

5.1 Deficiencies that Require a Boil Water Advisory

Deficiencies that require a boil water advisory include:

- 1) The presence of *E. coli* in multiple samples collected from the drinking water system on the same day;
- 2) The confirmed presence of *E. coli* in a confirmation sample collected from the same location in the drinking water system;
- 3) The presence of *E. coli* in a single sample collected from the distribution system together with other evidence that indicates the water supply system may present a threat to public health (e.g. low chlorine residual, high turbidity, water main break, etc.);
- 4) Lack of disinfection (i.e. all systems) or failure of a key water treatment process (e.g. filtration process for systems relying on surface water or GUDI sources);
- 5) Use of an emergency water supply from a system that does not have treatment to meet log reduction requirements for viruses (i.e. all systems), and protozoa (i.e. *Giardia* and *Cryptosporidium* – systems relying on surface water or GUDI sources);

- 6) Other circumstances which, in the opinion of NSE or the MOH, constitutes a risk to public health (e.g. *Giardia*, *Cryptosporidium* contamination, etc.);
- 7) Evidence of an outbreak of waterborne illness as determined by the MOH (the risk to young children, elderly and immuno-compromised people should be considered in a decision);
- 8) A serious incident of raw water contamination; and
- 9) Loss of positive pressure in the entire drinking water distribution system or portion of the service area, at street level.

5.2 Deficiencies That May Require a Boil Water Advisory

Prior to issuing an advisory for the deficiencies listed below, the owner shall consult with NSE.

Deficiencies that may require a boil water advisory include, but are not limited to:

- 1) The presence of *E. coli* in a single sample collected from the system if the results of the investigation suggest potential contamination of the supply and/or the owner is unable to collect a confirmation sample immediately;
- 2) Suspected cross-connection;
- 3) Indicators of poor water quality as evidenced by sample results indicating the presence of total coliform in the water leaving the treatment plant and other indicators of poor water quality such as high turbidity, low chlorine residual, etc.

5.3 Boil Water Advisory – Initiated by NSE

A boil water advisory shall be initiated by NSE at any time, in accordance with section 5.4, if:

- 1) The owner is unable or unwilling to conduct an investigation as outlined in section 4.3;
- 2) The owner is unable or unwilling to take corrective action to restore water quality;
- 3) The investigation indicates a problem that results in a threat to public health; or
- 4) Any other circumstance in which it is believed that public health may be at risk from the water supply.

5.4 Boil Water Advisory Protocol and Communication Plan

5.4.1 Initiating the Advisory

Where one or more of the conditions described in Section 5.1 exists, the owner shall initiate a boil water advisory and contact NSE immediately.

Where one or more of the conditions described in Section 5.2 exists, the owner may initiate a boil water advisory after consultation with NSE.

If NSE is aware of a potential serious health risk, NSE will advise the water supply owner to initiate a boil water advisory.

When a boil water advisory is to be initiated, the owner shall provide a communication plan to NSE. A communication plan for all types of water advisories should be developed as part of the owner's emergency notification/contingency planning process. Depending on the circumstances of the advisory, NSE may accept or modify the plan, in consultation with the owner. During the boil water advisory, there should be frequent communication between NSE and the owner.

For additional guidance on the communication of water advisories to the public, owners can reference the most recent version of the "*Drinking Water Advisory Communication Toolbox*". The document is a collaborative effort by the U.S. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, American Water Works Association, and the U.S. Department of Health and Human Services.

5.4.2 Procedure for Public Notification

- 1) The owner will inform consumers in a manner and frequency acceptable to NSE;
- 2) If the owner fails to notify consumers, NSE will take appropriate steps to notify consumers.

A boil water advisory must be effectively communicated to the public. At a minimum, the communication plan shall contain the following information:

- Who at the utility will oversee the notification (position, telephone number);
- Who the utility will notify directly including names and telephone numbers for NSE, and large users (e.g. institutions, health care facilities, manufacturing plants, etc.);
- What messaging will be communicated to the public (refer to Appendix C for guidance);
- How the public will be notified (e.g. social media, website, radio, television, newspaper and/or other print media, etc.);
- How the public will be kept informed of the status of the advisory and how frequently once the advisory has been issued (e.g. hourly advertisements on the radio, daily updates on social media and/or other print media, etc.); and
- Once the advisory is removed by NSE, how the removal of the advisory will be communicated to the public including messaging, utility contact person, how frequently the public will be notified and for what duration.

All methods of communication to the public are to be maintained throughout the duration of the advisory. In the case of an immediate serious public health threat other methods of notification, such as door-to-door and installation of signage, may be necessary. This will be determined in consultation with NSE and the MOH.

5.4.3 Suggested Wording

“Due to water quality problems and the possibility of unsafe water, consumers are advised to boil all water for at least 1 minute after the water reaches a rolling boil, for the purposes of drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, dental hygiene or any other activity that may result in human consumption. This is to be done until further notice” (refer to Appendix C).

5.4.4 Follow up Communication Plan

After a boil water advisory has been issued, the owner shall keep the public informed about the status of the advisory. How the public will be kept informed and how frequently they will be updated on the status of the advisory shall be included in the communication plan. For example, the owner shall update the public hourly using advertisements placed on local radio stations. The owner may also choose to put a telephone hot line in place during the advisory to allow affected residents to call with any questions they may have.

Some businesses, institutions, manufacturing plants or health care facilities may have to take additional precautions during a boil water advisory (refer to Appendix E). There may be circumstances where these facilities should be contacted as part of the owner’s communication plan to assure compliance with these precautions.

Once the advisory is removed by NSE, the owner shall notify the public of the removal of the advisory in accordance with their communication plan.

5.4.5 Instructions for Boiling and Disinfecting Tap Water

During an advisory it is essential that all water to be used for the following activities be boiled for at least one minute after it reaches a rolling boil:

- 1) drinking;
- 2) preparing infant formulas;
- 3) preparing juices and ice cubes;
- 4) washing fruits and vegetables;
- 5) cooking;
- 6) dental hygiene; or
- 7) any other activity that may result in human consumption.

Detailed instructions for boiling and disinfecting tap water during a boil water advisory are included in Appendix D. Instructions for businesses, institutions, manufacturing plants or health care facilities that may have special requirements when the boil water advisory is in effect are provided in Appendix E.

5.5 Removing the Boil Water Advisory

A boil water advisory will be removed by NSE, in consultation with the MOH and system owner. Under normal circumstances a boil water advisory will be removed when the following criteria are met:

- 1) When the treatment, distribution, or operational malfunction has been corrected, sufficient finished water displacement has occurred in the water works system to eliminate potentially contaminated water, and system performance indicates barriers are in place to protect health (e.g. disinfectant residual, turbidity, etc.); and
- 2) The *Guidelines for Canadian Drinking Water Quality* for bacteriological quality are met for 2 consecutive sets of samples separated by a minimum of 24 hours.

If a boil water advisory is not issued due to the presence of bacteria, NSE may alter the process for removing the advisory so that two samples for total coliform and *E. coli* bacteria separated by a minimum of 24 hours are not required to lift the advisory. Prior to lifting the advisory, NSE must be satisfied that altering the process will not result in a risk to public health.

6. Monitoring for Chemical, Physical and Radiological Quality

An owner of a municipal drinking water facility must meet specific standards for water quality and operations. This section discusses parameters that the utility must monitor to ensure the production of clean, safe drinking water. Compliance with these sampling requirements shall be demonstrated in the utility's annual sampling plan that must be submitted on or before October 1st of each year. NSE may modify these parameters as part of a facility's operating approval.

Any conditions included in the facility's operating approval will always take precedence over these *Guidelines*.

6.1 General Chemical and Physical Water Quality Parameters

The owner shall monitor for general chemical and physical water quality. The parameters to be monitored are shown in Table 3 and include inorganic and physical parameters with recommended limits in the *Guidelines for Canadian Drinking Water Quality* and some with no guideline values.

Table 3 – General Chemical and Physical Parameters

Alkalinity	Colour	pH
Aluminum	Conductivity	Potassium
Ammonia	Copper	Selenium
Antimony	Fluoride	Sodium
Arsenic	Hardness	Strontium
Barium	Iron	Sulphate
Boron	Lead	Total Dissolved Solids
Cadmium	Magnesium	Total Organic Carbon
Calcium	Manganese	Turbidity
Chloride	Nitrate	Uranium
Chromium	Nitrite	Zinc

6.1.1 Sample Frequency, Number and Location

An owner of a municipal drinking water supply shall sample a surface water or GUDI supply at least annually or a secure (Non-GUDI) groundwater supply at least once every two years. On each occasion two samples shall be collected: one sample from the raw water source and one sample from a point after treatment. The same sample points shall be used each year.

If there is reason to suspect the presence of other substances not listed in Table 3 in a public drinking water supply, an owner shall monitor for these substances to ensure that their concentrations are below acceptable limits.

NSE may alter the frequencies, locations, number of samples and parameters to be monitored depending on local conditions, analytical results, risk assessments conducted as part of the source water protection planning process or changes to the *Guidelines for Canadian Drinking Water Quality* pursuant to Section 33 of the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.

6.2 Health-Related Parameters – *Guidelines for Canadian Drinking Water Quality*

The health-related parameters in the most recent version of Health Canada's *Guidelines for Canadian Drinking Water Quality* are required to be measured every five-years for raw and treated water to ensure the supply does not exceed the MAC. Depending on the parameter, specific timing for sample collection may be indicated (e.g. pesticides, cyanobacterial toxins, etc.). In consultation with NSE, the owner shall increase the sampling frequency for parameters that have detectable levels. Compliance with the MAC established for a substance is required under the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.

6.3 Radionuclides

An owner shall sample for the presence of radioactivity using gross alpha and gross beta screening rather than measurements of individual radionuclides. If screening levels are exceeded (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta), then concentrations of specific radionuclides shall be analyzed.

6.4 Disinfection By-Products

Disinfection by-products (DBP) are chemical compounds formed by the reaction of a disinfectant with a precursor (e.g. natural organic matter). DBP of concern include: trihalomethanes (THMs), halo-acetic acids (HAAs), chlorate, chlorite, bromate, and N-nitrosodimethylamine (NDMA). Additional monitoring information is outlined below.

6.4.1 Trihalomethanes (THMs)

Trihalomethanes form as a byproduct of disinfection with chlorine. THMs shall be sampled quarterly by utilities that use chlorine as a disinfectant. Samples shall be collected in areas of the distribution system with the highest potential THM concentration(s) such as areas with the longest disinfectant retention times - typically the farthest points from chlorine injection site. A compliance value is determined by averaging the last four quarterly sample results separately for each sample location, if more than one location is sampled (i.e. locational running annual average⁷). Once a compliance value is determined for each sample location, non-GUDI groundwater supplies with THM concentrations less than 0.01 mg/L (10 µg/L) may request a reduction in sampling frequency to annual. Surface water and GUDI sources are not eligible for this reduction in sampling.

6.4.2 Haloacetic Acids (HAAs)

Haloacetic acids form as a byproduct of disinfection with chlorine. HAAs shall be sampled quarterly by utilities that use chlorine as a disinfectant. Samples for HAA analysis shall be collected where historical data show the highest HAA concentration. Where historical data is not available, HAA concentrations shall be monitored in the middle and extremities of the distribution system. Areas where disinfectant residuals are significantly lower than the system average (e.g. residence time) shall be targeted. In systems with booster chlorination stations and water tanks/reservoirs, HAA concentrations shall be monitored downstream of these components. A compliance value is determined by averaging the last four quarterly sample results separately for each sample location (i.e. locational running annual average⁷). Once a compliance value is determined for each sample location, non-GUDI groundwater supplies with HAA concentrations less than 0.01 mg/L (10 µg/L) may request a reduction in sample frequency to annual sampling. Surface water and GUDI sources are not eligible for this reduction in sampling.

⁷ The locational running annual average (LRAA) is calculated by averaging the concentration of the last four quarterly samples from each sampling point. E.g. Site A sample results: Q1: 45, Q2: 65, Q3:73, Q4: 85. Site A LRAA = 67.

6.4.3 Chlorate

Chlorate forms as a by-product of disinfection with chlorine dioxide and can form in sodium hypochlorite solutions that are not properly stored.

Chlorate shall be sampled quarterly by utilities using chlorine dioxide as a disinfectant. Chlorate samples shall be collected at the mid-point and far-point⁸ of the distribution system.

Chlorate shall also be sampled by utilities using sodium hypochlorite as a disinfectant and when solutions are stored for longer than three months. Chlorate samples shall be collected where treated water enters the distribution system.

6.4.4 Chlorite

Chlorite forms as a by-product of disinfection with chlorine dioxide. Chlorite shall be sampled quarterly by utilities that use chlorine dioxide as a disinfectant. Samples for chlorite analysis shall be collected at the mid-point and far-point of the distribution system.

6.4.5 Bromate

Bromate forms when ozone reacts with naturally occurring bromide and in sodium hypochlorite solutions that are not properly stored. Sodium hypochlorite solutions should be stored in a cool, dry location away from sunlight where the temperature does not exceed 30°C. Bromate shall be sampled monthly by utilities that use ozone as a disinfectant. Bromate shall also be sampled by utilities whenever sodium hypochlorite is used as a disinfectant and when solutions are stored for longer than three months. Samples for bromate analysis shall be collected where treated water enters the distribution system.

6.4.6 N-Nitrosodimethylamine (NDMA)

NDMA forms as a by-product of disinfection with chloramines. It may also form in chlorinated systems with nitrogen or humic substances present in the source water. NDMA shall be sampled quarterly by utilities that rely on surface water sources that practice chlorination or any utility that practices chloramination. For utilities that practice chlorination and have nitrogen or humic substances present in the source water, a sample for NDMA shall be collected where treated water enters the distribution system. For utilities that practice chloramination, samples for NDMA shall be collected where treated water enters the distribution system and a far-point in the distribution system. The owner of a utility that chlorinates and has nitrogen or humic substances present in the source water, may request a reduction from quarterly sampling to annual, if sampling consistently (e.g. over a year period) confirms the absence of NDMA in treated water entering the distribution system.

8 Far-point is defined as a location in the distribution system with the longest disinfectant retention time; typically, farthest from the disinfectant injection site.

6.5 Manganese

Manganese is a naturally occurring element found widely in surface water and groundwater sources in Nova Scotia. It is largely attributed to the weathering of manganese-bearing rocks and soils; however, anthropogenic sources including mining and industrial activities may impact water sources.

Routine Monitoring

With the introduction of a health-based guideline for manganese, enhanced monitoring is required to capture seasonal variation in source water and ensure public health protection. The minimum monitoring requirements are outlined in Table 4.

Table 4 – Routine Monitoring Requirements

Source	Sample Location	Frequency
Groundwater	• Raw water (prior to treatment)	Twice per year (spring and fall)
	• Entering the distribution system	Quarterly
	• Distribution system*	Quarterly
Surface Water	• Raw water (prior to treatment)	Quarterly
	• Entering the distribution system	Quarterly
	• Distribution system*	Quarterly

*Distribution system sample locations should provide an overall assessment of manganese levels in the distribution. Examples of suitable manganese sample locations will depend on system-specific distribution system characteristics as well as water quality. Consideration should be given to the following:

- Proximity to treatment plant;
- Evidence of increased biofilm;
- Areas with long stagnation or other indicators of poor water quality;
- Areas with evidence of increased corrosion;
- Event-based sampling following main breaks, hydrant flushing etc.

Existing approved distribution sampling locations for assessing corrosion may be used if these locations meet the intent of assessing manganese concentrations throughout the system.

Reduced Sampling

An owner may submit a request to NSE for a reduction in sampling if one of the following conditions are met:

- If raw water manganese concentrations are less than the aesthetic objective (AO) for a period of 2 consecutive years, the owner may reduce raw water sampling to once per year for surface water sources or once every two years for groundwater sources.
- If treatment is installed to reduce manganese, the owner may reduce raw water sampling to once per year for surface water sources or once every two years for groundwater sources. Quarterly sampling of the water leaving the plant and the distribution system sampling will still be required.

Historical manganese data submitted along with the request must meet the minimum monitoring requirements (source, frequency and location) outlined in Table 4 for consideration.

The owner is required to continue monitoring per the requirements outlined in their approval or latest approved sampling plan until written approval is received from NSE.

6.6 Cyanobacterial Toxins

Cyanobacteria, commonly referred to as blue-green algae, are capable of producing toxins known as cyanotoxins that can cause negative health effects in humans. To be protective of public health, the following guidance on monitoring and sampling algal blooms shall be adhered to:

1) Visual Inspection

Owners of surface water supplies shall visually monitor the source water at the intake weekly between May and October. Additional locations for visual inspection can include banks and shorelines if the source is known or suspected to be susceptible to the formation of blooms.

Early visual signs of a bloom may include water that appears unusually cloudy or the presence of what appears to be fine grass clippings. Colours can range from grey, tan to olive, blue-green to bright blue or red. As the bloom develops, the water may take on a “pea soup” or “spilled paint” appearance. A fresh bloom can smell like newly mown grass. Older, decaying blooms may smell like rotting garbage.

If an algal bloom is suspected or confirmed visually, sampling shall be conducted as outlined in Step 2 below.

2) Sampling

An owner shall notify NSE as soon as they become aware of a suspected bloom and conduct sampling:

- Raw and treated water samples shall be tested for Total Microcystins;

Note: It is recommended that raw water samples be tested for species identification and cell count as this information may inform on-going sampling requirements, removal efficiency of treatment processes, potential optimization needs and the types of toxins that may be present.

NSE may also direct the owner to take samples for additional toxin analysis (e.g. anatoxins, saxitoxins etc.). This will be determined in consultation with the MOH.

Any bloom shall be treated as potentially toxic and a significant health risk until sampling confirms otherwise. In consultation with the MOH, NSE may issue a “Do Not Consume” or a “Do Not Use” advisory while waiting for laboratory results, or if the source water is considered vulnerable by the MOH. Field test kits can be used by the owner as a qualitative (presence/absence) tool for determining if a bloom is toxic but do not provide quantitative analysis that can be used to determine if treated drinking water concentrations of cyanobacterial toxins are below the MAC.

3) Nutrient Source Identification

The owner shall initiate an evaluation of potential nutrient sources by conducting a site visit of the waterbody and surrounding watershed. Potential sources of nutrients can include:

- Stormwater runoff
- Agricultural runoff
- Industrial runoff
- Wastewater effluent
- Faulty septic systems
- Household fertilizers

Additional sampling may be conducted in the watershed to confirm source of nutrients or bloom including but not limited to:

- Phosphorus
- Nitrogen
- Turbidity
- Temperature
- pH
- TOC
- Dissolved oxygen
- Chlorophyll A
- Phycocyanin
- Cell count
- Algal speciation
- Cyanobacterial toxins

4) Analysis of Laboratory Results

The owner shall notify NSE upon receipt of any laboratory sample results.

If treated water results exceed the GCDWQ cyanobacterial toxin MAC, NSE, in consultation with the MOH, shall direct the owner to issue a “Do Not Consume” or a “Do Not Use” advisory if one has not already been issued. If the raw water results exceed the GCDWQ cyanobacterial toxin MAC but the treated water results are below the guideline, NSE will consult with the MOH to determine whether to issue an advisory. If both the raw and treated water results are below the GCDWQ cyanobacterial toxin MAC, NSE, in consultation with the MOH, may remove the advisory if one was issued.

Additional responses may be required based on the results of the algae species identification and cell counts. NSE, in consultation with the MOH, may request additional treatment, increased sampling frequency or other water restrictions dependent on-site specific conditions, size of the bloom and laboratory results.

5) On-going Sampling During a Bloom

On-going cyanobacterial toxin testing (frequency, parameters, sampling locations, etc.) will be determined by NSE on a case-by-case basis. NSE will notify the owner of these requirements.

6.7 Sample Collection and Preservation

An owner shall collect samples for chemical, physical and radiological quality in accordance with the methodology provided by the water testing lab. Some parameters require specialized sampling techniques (e.g. disinfection by-products, cyanobacterial toxins, pesticides etc.). The owner shall record the facility’s operating approval number on the lab’s sample submission form.

6.8 Reporting of Sample Results

An owner shall ensure that all sample results are sent from the lab to the owner. An owner shall record summaries of routine sample results in a uniform manner. The minimum information required in the summary is date, time, location of sample collection, sampler’s name, parameter, and the test result. The owner shall maintain records of sample results, including the original lab certificates, for a minimum of ten years from the date of collection and make the results available to NSE upon request.

Whenever a sample exceeds a MAC, the lab shall immediately notify NSE and forward the results to NSE. Upon receipt of sample results exceeding a MAC, the owner shall immediately notify the local NSE office by telephone and forward a copy of the results to NSE. All results sent electronically from the owner must be confirmed with NSE by telephone. If the owner is not able to speak with a person from the NSE office directly, the owner shall call the after-hours number at 1-902-893-6347. The after-hours number shall be contacted outside of normal business hours: weekdays – 4:30pm to 8:30am, weekends and holidays.

Upon receipt of sample results indicating a MAC is exceeded, the owner shall comply with section 6.9 of this Guideline, “Re-sampling Procedure” and section 10.0, “Corrective Actions to be Taken when a Sample Exceeds a Health-Related Chemical Parameter”. If a “do not consume” or “do not use” advisory is required (refer to section 11.0), the owner shall comply with section 11.1.

6.9 Re-sampling Procedure

Where results indicate that a MAC has been exceeded, the owner shall collect a confirmation sample for that parameter immediately after receiving notification from the lab. If a confirmation sample cannot be collected within 24 hours (e.g. weekend, holiday, etc.), the owner shall immediately notify NSE with a proposed sample date. NSE, in consultation with the MOH, may require the owner to take special precautions to ensure the protection of public health while awaiting the sample results from the lab.

If the confirmation sample indicates that the MAC is exceeded for the parameter of concern, the owner shall immediately notify the local NSE office by telephone and forward a copy of the results to NSE. All results sent electronically from the owner must be confirmed with NSE by telephone. If the owner is not able to speak with a person from the NSE office directly, the owner shall call the after-hours number at 1-902-893-6347. The after-hours number shall be contacted outside of normal business hours: weekdays – 4:30pm to 8:30am, weekends and holidays. The owner shall comply with section 10.0, “Corrective Actions to be Taken when a Sample Exceeds a Health-Related Chemical Parameter”. If a do not consume or do not use advisory is required, the owner shall comply with section 11.1.

If the confirmation sample indicates that the MAC is not exceeded for the parameter of concern, NSE may require that additional samples be taken to further evaluate the need for compliance pursuant to Section 33 (2) of the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.

6.10 Compliance – Chemical, Physical and Radiological Parameters

An owner of a municipal drinking water facility in which the level of a substance is confirmed to exceed a MAC, upon re-sampling, is out of compliance with the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations. The water supply owner, in consultation with NSE, shall take corrective action as outlined in section 10.0, “Corrective Actions to be Taken when a Sample Exceeds a Health-Related Chemical Parameter”.

7. Corrosion Monitoring Program

A corrosion monitoring program is required by owners to ensure that the distributed water is not corrosive. While the main contaminant of concern is lead, corrosion of other distribution system metals such as copper, iron, etc. can affect the aesthetic quality of the water as well as increase deterioration rates of distribution system infrastructure and premise plumbing materials. This section outlines the minimum corrosion monitoring requirements as well as additional recommended monitoring to enhance a system's corrosion assessment/control program.

7.1 Corrosion Assessment Monitoring Requirements

To assess the corrosivity of water, an owner is required to undertake the minimum sampling requirements outlined in Table 5.

An owner may wish to undertake additional monitoring on a regular or event-based frequency with the inclusion of additional parameters and/or by increasing the monitoring frequency as corrosion cannot readily be measured by any single method. Corrosion indices (e.g. Langelier Index) are no longer supported by Health Canada or the American Water Works Association (AWWA) as the sole means to assess the corrosivity of water distributed. Additional monitoring is recommended in the following circumstances:

- To gather baseline corrosion data;
- To assess corrosion of distribution system material;
- To conduct advanced corrosion modelling;
- During/after planned changes to the treatment process;
- Following a watermain break, spring flushing programs or hydrant flushing.

Table 5 – Corrosion Assessment Monitoring Requirements

Parameters	Location	Frequency
Distribution System Monitoring – number of required distribution samples included in Table 6		
Lead – Flushed Sample	Representative locations ⁹ in distribution system	Annually – during the warmest month
<ul style="list-style-type: none"> • Alkalinity • pH • Temperature • Conductivity • Dissolved Oxygen • Chlorine or Chloramine Residual • Corrosion Inhibitor Residual (if used) 	Point of entry to the distribution system and representative locations ⁹ in distribution system	Quarterly
Distribution System Monitoring – Optional Parameters		
<ul style="list-style-type: none"> • Copper • Zinc • Iron • Chloride and Sulphate • Total Dissolved Solids (TDS) • Hardness • Dissolved Inorganic Carbonate (DIC) • Aluminum • Manganese • Ammonia • Natural organic matter • Microbiological parameters (HPC) • Oxidation Reduction Potential (ORP) 	Point of entry to the distribution system and representative locations ⁹ in distribution system	Quarterly

⁹ Representative locations include hydraulically distinct areas, locations with evidence of increased biofilm, areas with evidence of long stagnation or other indicators of poor water quality such as discolored water complaints, areas with evidence of increased corrosion (e.g. increased number of breaks and/or leaks etc.).

7.1.1 Corrosion Assessment - Distribution System Monitoring

Corrosion assessment monitoring of the distribution system not only provides information on the corrosivity of the distributed water but can also be used to inform process changes and corrective actions required to reduce lead and other metal concentrations at the tap. Alkalinity, pH, temperature, conductivity, dissolved oxygen, disinfectant residual, and corrosion inhibitor residual (if used) are considered the minimum parameters required. These parameters shall be sampled quarterly at the point-of-entry to the distribution system along with representative locations throughout the distribution system. The minimum number of distribution monitoring sites is based on the population served (*refer to Table 6*). In some cases, additional sites may be required to adequately characterize the distribution system. The sample locations shall be flushed to remove stagnant water prior to sample collection.

Flushed samples for lead shall also be collected annually during the warmest month from representative locations throughout the distribution system based on population served (*refer to Table 6*). These samples are used to identify the source of lead due to fittings and other components in the distribution system.

Table 6 – Minimum Number of Distribution System Corrosion Monitoring Sites Required

System Size (# of people served)	Number of Sampling Points in the Distribution System
>100 000	10
10 001-100 000	6
3 301-10 000	4
501-3 300	2
101-500	1
≤100	1

8. Source Water Protection Monitoring

The source water protection planning process requires the development of a monitoring program. Parameters shall be sampled by the owner, at the frequency identified in the implementation schedule, to evaluate the effectiveness of the source water protection plan. Monitoring associated with this program shall be designed to evaluate changes in the source water protection area. These parameters are, in addition to the raw water sampling requirements, laid out in the facility's approval to operate. The owner shall review and update the plan and implementation schedule on a yearly basis. The status and activities of the plan and any modifications made shall be included in the facility's annual report that must be submitted to NSE on or before April 1st of each year.

9. Operational Monitoring

There are several critical water quality parameters that are monitored throughout the treatment process and distribution system to ensure the production and delivery of safe drinking water to consumers. This includes parameters to evaluate the efficiency of the treatment processes (e.g. disinfection, filtration, etc).

Additional information can be found in the facility's operating approval and the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*. Monitoring requirements defined in a facility's operating approval and approved annual sampling plan will always take precedence.

9.1 Turbidity

Turbidity is considered an important surrogate measure for microbiological quality. Increased turbidity may be associated with a contamination event or may interfere with disinfection. Turbidity limits measured in nephelometric turbidity units (NTU) are found in the facility's approval to operate. If the turbidity exceeds requirements outlined in the approval, the owner is required to report the exceedance to NSE immediately.

For surface water and high risk GUDI sources, raw water turbidity shall be monitored continuously or by a grab sample at least once per day. Individual filter turbidity shall be monitored continuously (i.e. minimum of one measurement every five minutes). The turbidity of filtered water directed to waste shall be monitored continuously or by a grab sample during the filter-to-waste step.

For medium risk GUDI sources awarded a natural filtration log credit, turbidity shall be monitored continuously for each GUDI well at the wellhead.

For non-GUDI sources, turbidity shall be monitored continuously or by a daily grab sample at each individual wellhead or the combined flow from multiple wells.

For all sources, distribution system turbidity shall be monitored weekly at the same locations where samples are collected for total coliform and *E. coli* bacteria.

9.2 Primary Disinfection

The chemical disinfection process is considered effective if the ratio of the achieved CT¹⁰ value (calculated) to the required CT value (from CT table) is equal to or greater than one.

Chemical disinfectants acceptable for primary disinfection include free chlorine, chlorine dioxide and ozone. Parameters necessary to calculate disinfection efficiency must be monitored to ensure design criteria are met during primary disinfection. Typically, design ranges are set for worst case scenarios that affect the primary disinfectant. For chlorine, examples include max flow, min. temperature, min. disinfectant residual, and max pH.

10 CT = Concentration of Chemical Disinfectant (mg/L) X Time (minutes) X Baffling Factor

The effectiveness of the disinfection process using ultra-violet (UV) light is determined by a concept known as IT¹¹. The amount of UV light delivered to pathogens in the reactor is called the UV dose and is measured in mJ/cm². Parameters necessary to calculate the effectiveness of UV disinfection include UV intensity, UV transmittance, and flow rate. Where UV light is used for primary disinfection, chemical disinfection shall be required to meet log inactivation criteria for viruses.

To ensure the effectiveness of the disinfection process, information regarding the parameters to be monitored, frequency and location are found in the in the facility's approval to operate. Information on calculating CT/IT, CT reference tables, and baffling factor are found in the most recent version of the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*. An owner shall immediately report to NSE any instance where the required CT/IT was not achieved.

9.3 Secondary Disinfection

Municipal drinking water facilities use secondary disinfection to maintain an effective disinfectant residual in the distribution system. Acceptable secondary disinfectants include free chlorine and chloramines.

If free chlorine is used as a secondary disinfectant, the process shall be operated to ensure a minimum free chlorine residual of 0.2 mg/L is maintained throughout the system and does not exceed 4.0 mg/L.

If chloramines are used for secondary disinfection, the process shall be operated to ensure a minimum of 1.0 mg/L combined chlorine residual is achieved throughout the water distribution system and does not exceed 3.0 mg/L.

To ensure the effectiveness of the secondary disinfection process, an owner is required to monitor the disinfectant residual at the locations and with the frequencies specified in their operating approval. An owner shall immediately report to NSE when the minimum secondary disinfectant residual is not achieved.

9.4 Fluoride

If a municipal water utility fluoridates their water, the owner shall monitor daily for fluoride concentrations at a location where the water enters the distribution system. Health Canada recommends an optimal concentration of fluoride in drinking water of 0.7 mg/L. An owner shall record fluoride measurements daily in a uniform manner and make the results available to NSE upon request.

9.5 Aluminum

An owner of a facility that uses an aluminum-based coagulant shall monitor aluminum concentrations monthly where water enters the distribution system and at select distribution system locations. Health Canada has established an operational guideline for aluminum based on the type of treatment process. Compliance with the guideline is based on the average of twelve-monthly samples taken from the same sample location.

¹¹ IT (UV Dose) = Ultraviolet Intensity (watts/cm²) X Time of Exposure (seconds)

9.6 Free Ammonia, Nitrate and Nitrite

An owner of a facility practicing chloramination shall monitor weekly for free ammonia, nitrate and nitrite in the distribution system. Sampling points shall include distribution system storage (e.g. water tanks, reservoirs, etc.) and dead ends.

10. Corrective Actions to be Taken when a Sample Exceeds a Health-Related Chemical Parameter

The owner of a municipal water supply shall notify NSE immediately, by telephone, of any sample result exceeding a MAC. Results sent electronically from the owner to NSE, must be confirmed with NSE, by telephone. If the owner is not able to speak with a person from the NSE office directly, the owner shall call the after-hours number at 1-902-893-6347. The after-hours number shall be contacted outside of normal business hours: weekdays – 4:30pm to 8:30am, weekends and holidays. A flowchart to assist owners respond to exceedances of health-related chemical parameters is found in Appendix F.

If a routine sample exceeds the MAC for a chemical parameter, specified in the most recent edition of the *Guidelines for Canadian Drinking Water Quality*, the owner shall:

- 1) Notify NSE immediately, by telephone as soon as they become aware of the exceedance.
- 2) Collect a confirmation sample for the parameter(s) of concern immediately upon receiving notification of the sample results from the lab. If the owner cannot collect a confirmation sample within 24 hours (e.g. weekend, holiday, etc.), they shall immediately notify NSE as soon as they've made this determination. NSE may require the owner to take special precautions to ensure the protection of public health while awaiting the confirmation sample results from the lab.
 - a) If the confirmation sample indicates the MAC is not exceeded for the parameter(s) of concern, the owner may return to routine sampling. NSE may require additional samples be taken to further evaluate the need for corrective action.
 - b) If the confirmation sample indicates that the MAC is exceeded for the parameter(s) of concern, the owner shall notify NSE immediately. NSE will notify the MOH and determine the need to issue a “do not consume” or “do not use” advisory. If an advisory is deemed necessary, NSE shall inform the owner and the owner shall immediately issue the advisory in accordance with section 11.1.
- 3) If the confirmation sample indicates the MAC is exceeded, the water supply owner shall develop an action plan for addressing such non-compliance issues. The action plan shall be prepared and submitted to NSE within 30 calendar days from when the water supply owner was notified by the lab that the confirmation sample exceeded the MAC.

The action plan shall:

- a) Determine why the water exceeds the MAC;

- b) Select a corrective action(s) to remove the source of contamination, provide treatment or switch to an acceptable alternate potable water supply. When an alternate water supply is recommended, it is important to ensure the microbiological safety of the supply before use;
 - c) Provide a schedule for implementation of the corrective action(s) for meeting the MAC.
- 4) After implementing the corrective action(s), the owner shall collect a sample for the parameter(s) of concern to demonstrate that the concentration is below the MAC (refer to the *Guidelines for Canadian Drinking Water Quality*, latest version).

If the water sample indicates that the corrective action(s) was not effective to reduce the concentration(s) below the MAC, the owner shall re-submit a corrective action plan (refer to Appendix F).

11. Do Not Consume and Do Not Use Advisories

A “do not consume” or “do not use” advisory is issued in situations where there is a potential or confirmed incident of contamination (natural or man-made) when the contaminant of concern may not be removed or inactivated by boiling; when there is a significant risk from ingestion, dermal contact, or inhalation of the contaminant; or when an unknown or unexpected chemical contaminant is detected in the drinking water system.

A “do not consume” or “do not use” advisory is issued in the following circumstances:

- a) The occurrence of an event that may have or has caused massive contamination to the drinking water supply (e.g. oil spill in source water);
- b) Exceedance of the guideline value (MAC) for a chemical contaminant with an acute health effect from short-term exposure;
- c) The presence of a chemical contaminant with no established guideline but which may pose a health risk from short term exposure;
- d) Circumstances in the opinion of NSE, in consultation with the MOH, constitute a risk to public health.

A “**do not consume**” advisory is issued where exposure to the contaminant is only a concern through ingestion. A “do not consume” advisory is issued to advise the public to avoid using the water for drinking, preparing food, beverages, or ice cubes, washing fruits and vegetables, dishwashing, oral hygiene and/or any other use that may result in human consumption. Boiling the water does not remove the contaminant.

A “**do not use**” advisory is issued where dermal or inhalation exposure to the contaminant could affect the skin, eyes, and/or nose. A “do not use” advisory is issued to advise the public to avoid the water for all domestic purposes including all uses identified for a “do not consume” advisory as well as activities such as showering and bathing. Boiling the water does not remove the contaminant.

11.1 Do Not Consume or Do Not Use Advisory Protocol and Communication Plan

11.1.1 Initiating the Advisory

Where one or more of the conditions described in section 11.0 exists, the owner shall contact NSE immediately to determine the need to issue an advisory. NSE will consult with the MOH.

When an advisory is to be initiated, the owner shall provide a communication plan in writing to NSE. The information contained in the plan and how it will be communicated to affected users shall be developed as part of the system owner's emergency notification/contingency planning process. Depending on the circumstances of the advisory, NSE may accept or modify the plan, in consultation with the system owner.

During the advisory, there should be frequent communication between NSE and the system owner.

For additional guidance on the communication of water advisories to the public, owners can reference the most recent version of the *"Drinking Water Advisory Communication Toolkit"*, a collaborative effort by the U.S. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, American Water Works Association, and the U.S Department of Health and Human Services.

11.1.2 Procedure for Public Notification

- 1) The owner will inform consumers in a manner and frequency acceptable to NSE.
- 2) If the owner fails to notify the consumers, NSE will take appropriate steps to notify consumers.

The "do not consume" or "do not use" advisory must be effectively communicated to the public. At a minimum, the communication plan shall contain the following information:

- Who at the utility will oversee the notification (position, telephone number);
- Who the utility will notify directly including names and telephone numbers for NSE, and large users (e.g. institutions, health care facilities, manufacturing plants, etc.);
- What messaging will be communicated to the public (see Appendix C);
- How the public will be notified (e.g. social media, website, radio, television, newspaper and/or other print media, etc.);
- How the public will be kept informed of the status of the advisory and how frequently once the advisory has been issued (e.g. hourly advertisements on the radio, daily updates on social media and/or other print media, etc.); and
- Once the advisory is removed by NSE, how the removal will be communicated to the public including messaging, utility contact person; how frequently the public will be notified and for what duration.

All methods of communication to the public are to be maintained throughout the duration of the advisory being in effect. In the case of an immediate serious public health threat other methods of notification, such as door-to-door and installation of signage, may be necessary.

11.1.3 Suggested Wording

Specific precautions will depend on the contaminant of concern. The following wording may need to be modified.

Do Not Consume Advisory

“Due to water quality problems and the possibility of unsafe water, consumers are advised not to use their water for drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, dental hygiene or any other activity that may result in human consumption. This is to be done until further notice. Boiling the water will not remove the contaminant.” (Refer to Appendix C for an example media release.)

Do Not Use Advisory

“Due to water quality problems and the possibility of unsafe water, consumers are advised not to use their water for any purpose that may result in consumption such as drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, and dental hygiene, etc. Residents are also advised not to use the water for showering or bathing. This is to be done until further notice. Boiling the water will not remove the contaminant”. (Refer to Appendix C for an example media release.)

11.1.4 Follow up Communication Plan

After the “do not consume” or “do not use advisory” has been issued, the owner shall keep the public informed about the status of the advisory. How the public will be kept informed and how frequently they will be updated on the status of the advisory shall be included in the communication plan. For example, the owner shall update the public hourly using advertisements placed on local radio stations. The owner may also choose to put a telephone hot line in place during the advisory to allow affected residents to call with any questions they may have.

Some businesses, institutions, manufacturing plants or health care facilities may have to take additional precautions during the advisory. These facilities should be contacted as part of the owner’s communication plan.

Once the advisory is removed by NSE, the owner shall notify the public of the removal of the advisory in accordance with their communication plan.

11.2 Removing the Do Not Consume or Do Not Use Advisory

The “do not consume” or “do not use” advisory will be removed by NSE in consultation with the MOH and the system owner when a risk to public health no longer exists. Under usual circumstances, the advisory will be removed when the event that prompted the issuance of the advisory is resolved and this is confirmed through sampling, where appropriate.

The advisory will be removed when one or more of the following is confirmed, as appropriate for the situation:

- a) Where there is evidence that the quality of the source water shows no contamination and the drinking water is safe for drinking and other uses;
- b) Where there is evidence that the source of the hazardous contaminant has been removed and the distribution system has been thoroughly flushed. Plumbing systems internal to buildings should also be flushed;
- c) If the advisory was due to a chemical spill impacting the source of the drinking water supply, when the spill has been cleaned up and a sample(s) has been collected to confirm this;
- d) When failures with the treatment process/distribution system have been addressed and operational parameters/samples can confirm this;
- e) Once appropriate treatment has been installed to remove or reduce the level of the contaminant and a sample has been collected to confirm this.

Appendix A

Sample Collection and Preservation - Microbiological Quality

Container

- Use a sterilized sample bottle containing sodium thiosulfate preservative (a chlorine neutralizer). Bottles are available from some local NSE offices, water quality laboratories, and from some hospitals. A list of approved laboratories is available on our website.
- Keep sample containers clean and free from contamination before and after collecting the sample. Do NOT open them prior to collecting the sample.
- Examine the sample bottle for cracks, a missing seal, or other signs that its sterility may be compromised. If any of these indications are found, discard the bottle and use a suitable one.
- Label the bottle with the water supply owner's name, location of the water source and/or sampling location, date, time, and the facility's approval number.

Flush the System

- Inspect the outside of the faucet. If water leaks around the outside of the faucet, select a different sampling site.
- Remove any aerators, strainers, attachments, or purification devices from the tap.
- If necessary, remove debris and sterilize the faucet outlet, for example by swabbing with a disinfecting wipe.
- DO NOT take samples from a flexible hose or garden hose or outside hose bib. Sample from the cold-water faucets only.
- Allow the water to run for a minimum of 5 minutes before collection. The intent is to remove stagnant water from the system and collect a sample that is representative of water in the distribution system, not the building.

Collect the Sample

- Record disinfectant residual. Normally free chlorine residual is measured; however, total chlorine residuals may be required on occasion. In either case, the chlorine residual should be recorded on the lab requisition form and be marked "F" or "T" to indicate free or total chlorine residual, respectively.
- Before taking the sample, reduce the tap flow rate to approximately the width of a pencil before taking the sample. The flow rate should be low enough to ensure that no splashing occurs as the container is filled. Do not adjust the flow rate while taking the sample. At sampling points where water runs continuously, do not adjust flow rate.

- While holding the sample container at the base, remove the seal around the cap before attempting to open the bottle.
- Remove the cap with the free hand. Be careful NOT TO TOUCH the inside of the bottle cap or bottle lip. Continue to hold the cap in one hand with the inside facing down while the bottle is being filled. Do NOT touch the interior of the cap or lay it down. Do NOT breathe on the bottle or cap.
- Do NOT rinse the bottle.
- Fill the bottle to the fill line. Do NOT allow the bottle to overflow. Carefully replace the cap.
- Complete the laboratory requisition form. Include all required information: approval number, sampling location, date, time, etc. and who took the sample. All water samples are to be analyzed for total coliform and *E. coli*.

Storage and Transport

- Samples shall be kept in a refrigerator or cooler with ice packs to maintain a temperature below 10°C until delivered to the lab. Samples should not be frozen.
- Transport the sample to the laboratory as soon as possible and within 24 hours of collection. Check ahead with the lab about day and/or time deadlines for sample acceptance to ensure meeting the 24-hour criterion.

Appendix B

The Growth of Biofilm in a Water Works System

Introduction

Biofilm in a water works system refers to organic or inorganic surface deposits consisting of microorganisms, microbial products and debris. Biofilm may occur on interior pipe surfaces, in sediments, inorganic tubercles, suspended particles or virtually any substratum immersed in the aquatic environment. Biofilm may be evenly distributed or occur as sporadic random patches.

Public Health Significance

Portions of a biofilm lining the interior of a water pipe may periodically slough off into the passing water thereby seeding it with microorganisms contained in the biofilm. If such bacteria are coliforms, the occurrence must be considered a public health concern until it is proven that a treatment failure or contamination has not occurred. It is difficult to distinguish between a true biofilm event and an unexplained coliform occurrence. Determination of coliform contamination due to biofilm is usually a negative conclusion; that is, there are no observable coliforms in the treatment plant effluent, no identified breakdown in treatment barriers, no apparent cross-connection or other contamination of the water works system (breaks, construction, etc.). While a true coliform biofilm event may not in itself signal a public health risk, it may mask a real contamination event and therefore must be viewed with concern. The onus is on the owner to show that these coliform occurrences are a result of biofilm release into the water supply.

Characteristic of a Situation Where Biofilm May be the Cause of Bacteria Counts within a Water Works System

- No coliforms are detected in treatment plant effluent.
- Coliform bacteria persist in a water works system samples despite the maintenance of a disinfectant residual.
- Seasonal increase in coliform densities with highest recovery in warm summer months, decreasing in the fall.
- The duration of the coliform episode is prolonged for years.
- Growth of heterotrophic bacteria, detected using the heterotrophic plate count (HPC) method, frequently occurs before coliforms are detected.
- Coliform growth occurs as a randomized pattern in the water works system.
- Some predominant coliform species can be identified, such as *Klebsiella*, *Enterobacter* or *Citrobacter*.
- Coliform occurrence persists despite proper operation and maintenance practices being carried out, including: consistently maintaining positive pressure in the water works system; implementing aggressive cross-connection control; thoroughly flushing and disinfecting pipes after construction and repair; and providing efficient treatment.

Appendix C

Draft Media Releases for Water Advisories

(Revise as necessary to fit specific circumstances)

a) Boil Water Advisory

Due to apparent contamination of the _____ public drinking water supply and the possibility of unsafe water, consumers are advised to boil all water for at least 1 minute, after it reaches a rolling boil, before drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, dental hygiene or any other activity that may result in human consumption. This is to be done until further notice.

The water utility is doing all it can to determine the cause of the problem and to remedy it as quickly as possible. The water utility and Nova Scotia Environment are continuing to monitor the water quality closely and are working in close consultation.

Detailed instructions on water usage when a boil water advisory is in effect are available from the water utility or the local office of Nova Scotia Environment.

For further information regarding this notice call: _____

b) Do Not Consume Advisory

Due to water quality problems and the potential for unsafe water, residents of the _____ public drinking water supply are advised not to use their water for drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, dental hygiene or any other activity that may result in human consumption. This is to be done until further notice. Boiling the water will not remove the contaminant.

The water utility is doing all it can to determine the cause of the problem and to remedy it as quickly as possible. The water utility is continuing to monitor the water quality closely and are working in close consultation with Nova Scotia Environment.

Detailed instructions on water usage when a “Do Not Consume” advisory is in effect are available from the water utility or the local office of Nova Scotia Environment

For further information regarding this notice call: _____

c) Do Not Use Advisory

Due to water quality problems and the potential for unsafe water, residents of the _____ public drinking water supply are advised not to use their water for any purpose that may result in human consumption such as drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables, cooking, and dental hygiene, or any other activity that may result in human consumption. Residents are also advised not to use the water for showering or bathing. This is to be done until further notice. Boiling the water will not remove the contaminant.

The water utility is doing all it can to determine the cause of the problem and to remedy it as quickly as possible. The water utility is continuing to monitor the water quality closely and are working in close consultation with Nova Scotia Environment.

Detailed instructions on water usage when a “do not use” advisory is in effect are available from the water utility or the local office of Nova Scotia Environment

For further information regarding this notice call: _____

Appendix D

Instructions for Boiling and Disinfecting Tap Water During a Boil Advisory

During an advisory, it is essential that all water to be used for the following activities be boiled for at least one minute after it reaches a rolling boil:

- drinking;
- preparing infant formulas;
- preparing juices and ice cubes;
- washing fruits and vegetables;
- cooking;
- dental hygiene; or
- any other activity that may result in human consumption.

Holding water at a rolling boil for at least 1 minute will inactivate all waterborne pathogenic micro-organisms. Water can be boiled in a pot or kettle on a stove, an electric kettle without an automatic shut-off or in a microwave oven. If water is boiled in a microwave, it is advisable to include a glass rod or wooden or plastic stir stick.

Under most circumstances it is not necessary to boil water used for other household purposes. Adults, adolescents and older children may shower, bathe or wash using tap water but should avoid swallowing the water. Toddlers and infants should be sponge bathed. In non-outbreak situations, dishes and laundry may be washed in tap water, either by hand or by machine.

In the event of a waterborne outbreak as declared by the Medical Officer of Health, it may be necessary to advise the public to take additional precautions. In this situation, hands can continue to be washed with tap water utilizing proper handwashing technique, followed by the use of an alcohol-based hand sanitizer containing more than 60% alcohol. Alcohol based hand sanitizers should be rubbed into all areas of the hands until hands are dry. Hands should not be towel dried. If dishes are washed by hand they should be washed and rinsed in hot tap water, soaked in a dilute solution of household bleach (20 mL of unscented bleach in 10 L of water) for one minute and air dried. Alternatively, dishwashers with a hot water (final rinse temp 82°C) or sanitizing cycle will disinfect dishes. During an outbreak, it is advisable to provide pets with boiled water that has been cooled as they can transmit waterborne disease organisms to humans.

Additional instructions for businesses, institutions, manufacturing plants or health care facilities that may have special requirements when a boil water advisory is in effect are provided in Appendix E.

Appendix E

Users That Must Take Particular Precautions During A Boil Advisory

a) Commercial Establishments (Restaurants, Hotels, etc.)

- All water that is to be provided directly to customers for drinking purposes must be treated by boiling the tap water for at least 1 minute, after it reaches a rolling boil, and then storing the water in clean, covered containers until used for serving. An alternative to this would be using commercially available “bottled water” from a supplier who is a member of the Canadian Bottled Water Association (CBWA) or the International Bottled Water Association (IBWA). Commercial coffee machines that achieve boiling temperatures as part of their design are exempt (see Notes).
- All foods (e.g. fruits and vegetables) that need washing are to be rinsed or soaked in tap water that has been boiled for at least 1 minute, after it reaches a rolling boil. An alternative to this would be using commercially available “bottled water” from a supplier who is a member of the Canadian Bottled Water Association (CBWA) or the International Bottled Water Association (IBWA).
- Tap water used as an ingredient in any food product that will be “ready to eat” without cooking (e.g. drink mixes, pudding, jellos, etc.) must be boiled for at least 1 minute, after it reaches a rolling boil. An alternative to this would be using commercially available “bottled water” from a supplier who is a member of the Canadian Bottled Water Association (CBWA) or the International Bottled Water Association (IBWA).
- Ensure that food handlers wash and rinse hands in water that has been treated with chlorine bleach.
- It is not necessary for bakeries to boil water that is part of a recipe or ingredient in a product that is to be baked. Water for other uses must be boiled.
- Disconnect ice machines and discard any ice and crushed ice products that has been made from this ice. All ice used during the boil water advisory must originate from tap water that has been boiled for at least 1 minute, after it reaches a rolling boil, or from a commercial ice supply distributor. Ice machines at the establishment must be emptied and not used for the duration of the boil water advisory. Lines to ice machines must be disinfected prior to reuse.
- All soft drink beverage lines connected directly to tap water for mixing must be disconnected for the duration of the boil water advisory. Use bottled water or canned beverages exclusively. Lines to soft drink canisters must be disinfected prior to reuse.
- Disconnect water vending machines unless the water is treated by an approved method. Disinfect lines prior to reuse.
- Disconnect vegetable spraying/sprinkler supplies. Disinfect lines prior to reuse.
- Commercial dishwashers that use hot water 82°C or above are considered satisfactory. Beverage glass washers that utilize a “cold” water rinse must not be used unless the rinse water can be changed to use hot water 82°C or above. For manually washed dishes, it is important that the sanitizer concentration be a minimum of 100 parts per million of chlorine. It is also important that dishes are allowed to air dry. Do not rinse with tap water.

- Use boiled water in all other uses in the kitchen such as washing and sanitizing cutting boards, counter tops, etc.
- All employees reporting that they are suffering from a diarrheal illness must be excluded from work and should be tested by their family doctor. They are not to return to work until symptoms have subsided. Good hand washing should be emphasized for all staff.

Notes:

Commercial coffee brewers generally operate at a brew temperature of 88°C - 90°C with this temperature being maintained in the water tank. Brewing is achieved by displacement of the hot water with cold water within the tank. The temperature attained by the hot water will control bacterial and protozoic organisms of concern during a boil water advisory. The temperature of the water should be verified using a metal stem probe thermometer by running a full cycle of the brewer with water, taking the temperature at a point below the funnel when the decanter is half full. The temperature at this point should be 72°C or higher.

The decanter used for filling the brewer with water should not be used for receiving the coffee before being washed and sanitized.

This exemption is not applicable to non-commercial or domestic type coffee brewers as there may be wide variations of temperatures in these machines.

Upon rescinding of a boil water advisory:

- Re-start and flush any water-using fixture or piece of equipment in accordance with the manufacturer's specifications. This may vary from fixture to fixture. Consult your facility engineer and/or manufacturer when restarting the equipment.
- Managers of large buildings with water-holding reservoirs should consult with their facility engineer about draining the reservoir.
- Follow the directions of your water utility or, as general guidance, run cold water faucets and drinking fountains for 3 minutes each.
- Run water softeners through a regeneration cycle.
- Drain and refill hot water heaters if set at a low temperature (below 64.2°C) taking all necessary precautions to avoid electrical shocks.
- Consult your facility engineer regarding pool and/or whirlpool operations.

b) Food Production

- **Dairy Plants** - The contaminated water must not contact products following the pasteurization procedure and water used in clean-in-place procedures and in cleaning of product related equipment must be properly chlorinated.
- **Bottling Plants** - Pre-superchlorination and chlorine removal must be a part of production procedure.
- **Ice Making** - It is prohibited to make ice for domestic purposes or for cooling or preservation of food for the duration of the boil water advisory unless the water has undergone proper treatment to inactivate microbial pathogens.

c) Hospitals, Clinics, Long Term Care Facilities, Nursing Homes, etc.

- Boil water or use an acceptable alternate potable water supply in all applications of tap water intended for human consumption or treatment procedures where a risk of infection is possible. **Assess all water usage in consultation with infection control personnel.**
- Patients and employees should not consume tap water that has not been disinfected, ice or drinks made with tap water that has not been disinfected, or raw foods rinsed with tap water that has not been disinfected.
- Disconnect ice machines and discard any ice and crushed ice products that have been made from this ice. All ice used during the boil water advisory must originate from tap water that has been boiled for at least 1 minute, after it reaches a rolling boil, or from a commercial ice supply distributor. Ice machines at the establishment must be emptied and not used for the duration of the boil water advisory. Lines to ice machines must be disinfected prior to reuse.
- For other food preparation and hand washing guidance, refer to the information provided under paragraph a) “commercial establishments”.
- Disinfect water by:
 - Boiling at a rapid, rolling boil for 1 minute; or
 - Filtering through a reverse osmosis filter, an “absolute 1 micron” filter.
- An alternate to this would be using commercially available “bottled water” from a supplier who is a member of the Canadian Bottled Water Association (CBWA) or the International Bottled Water Association (IBWA).
- All employees reporting that they are suffering from a diarrheal illness must be excluded from work and should be tested by their family doctor. They are not to return to work until symptoms have subsided. Good hand washing should be emphasized for all staff.
- Restrict burn patients and patients with open sores or wounds from whirlpool treatments.
- Monitor patients closely for signs and symptoms of gastrointestinal illness.
- Sanitize dishes by washing in dishwashing machines that have a hot water cycle at 82°C or above. For manually washed dishes, it is important that the sanitizer concentration be a minimal of 100 parts per million of chlorine. It is also important that dishes are allowed to air dry. Do not rinse with tap water.

Notes:

Renal dialysis units are routinely treated with water using reverse osmosis. This is considered an acceptable treatment process for publicly supplied water under a boil water advisory.

Upon rescinding of a boil water advisory:

- Re-start and flush any water-using fixture or piece of equipment in accordance with the manufacturer’s specifications. This may vary from fixture to fixture. Consult your facility engineer and/or manufacturer when restarting the equipment.

- Managers of large buildings with water-holding reservoirs should consult with their facility engineer about draining the reservoir.
- Follow the directions of your water utility or, as general guidance, run cold water faucets and drinking fountains for 3 minutes each.
- Run water softeners through a regeneration cycle.
- Drain and refill hot water heaters if set at a low temperature (below 64.2°C) taking all necessary precautions to avoid electrical shocks.
- Resume usual bathing practices and care for patients with breaks in the skin.
- Consult your facility engineer regarding pool and/or whirlpool operations.

d) Day Care Facilities

- Day care facilities in areas where a boil water advisory is in effect should be contacted and advised to use boiled or disinfected water for drinking, preparing infant formulas, preparing juices and ice cubes, washing fruits and vegetables and for all hand washing and dental hygiene.
- Children and employees should not consume tap water that has not been disinfected, ice or drinks made with tap water that has not been disinfected, or raw foods rinsed with tap water that has not been disinfected.
- Disinfect water by:
 - Boiling at a rapid, rolling boil for 1 minute; or
 - Filtering through a reverse osmosis filter, an “absolute 1 micron” filter.
- An alternate to this would be using commercially available “bottled water” from a supplier who is a member of the Canadian Bottled Water Association (CBWA) or the International Bottled Water Association (IBWA).
- All employees reporting that they are suffering from a diarrheal illness must be excluded from work and should be tested by their family doctor. They are not to return to work until symptoms have subsided. Good hand washing should be emphasized for all staff.
- Sanitize dishes by washing in dishwashing machines that have a hot water cycle at 82°C or above. For manually washed dishes, it is important that the sanitizer concentration be a minimum of 100 parts per million of chlorine. It is important that dishes be allowed to air dry. Do not rinse with tap water.

Upon rescinding of a boil water advisory:

- Re-start and flush any water-using fixture or piece of equipment in accordance with the manufacturer’s specifications. This may vary from fixture to fixture. Consult your facility engineer and/or manufacturer when restarting the equipment.
- Managers of large buildings with water-holding reservoirs should consult with their facility engineer about draining the reservoir.

- Follow the directions of your water utility or, as general guidance, run cold water faucets and drinking fountains for 3 minutes each if they have not been used in the last 24 hours.
- Run water softeners through a regeneration cycle.
- Drain and refill hot water heaters if set at a low temperature (below 64.20C) taking all necessary precautions to avoid electrical shocks.

e) Dental Offices

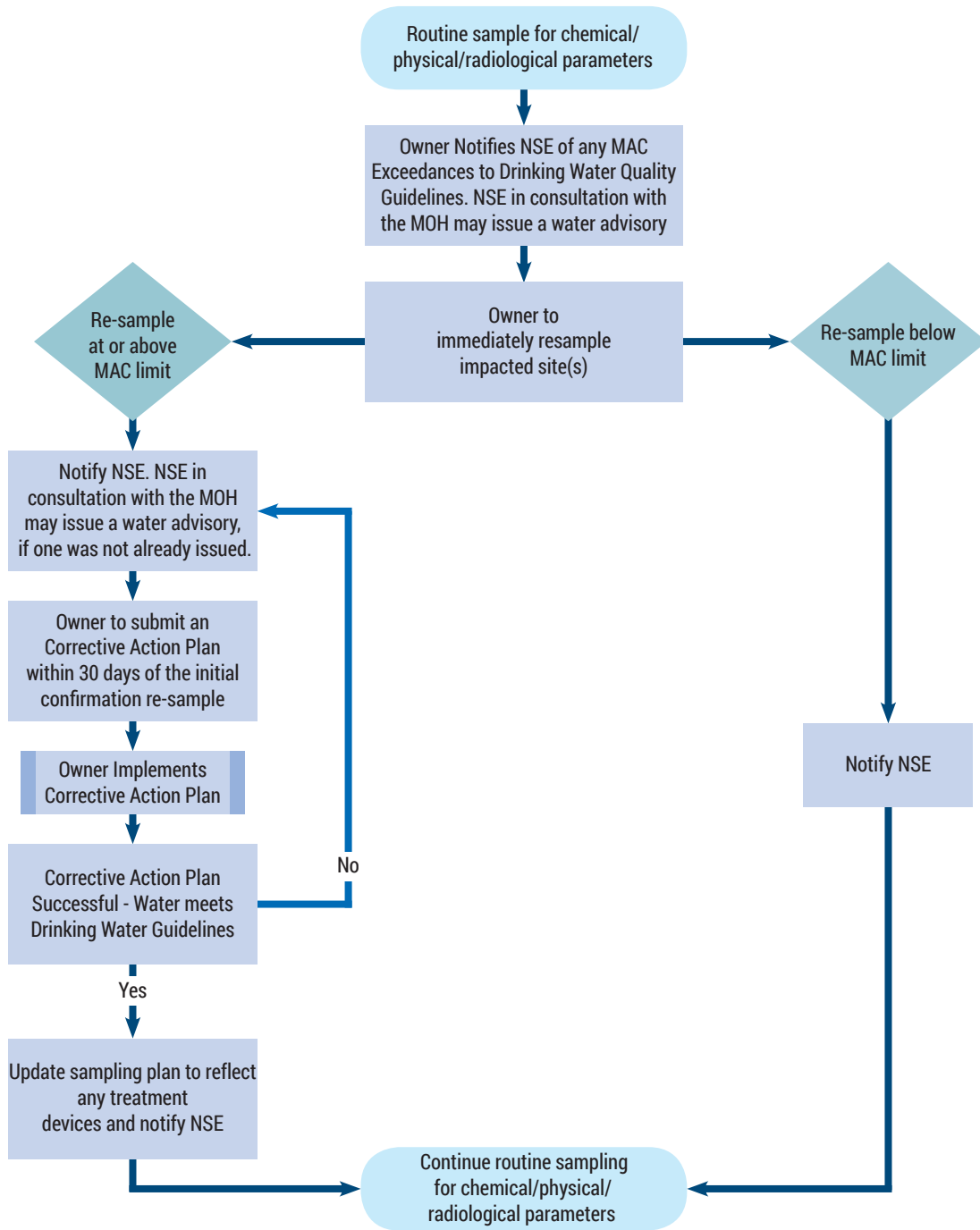
- Dentists, in areas where a boil water advisory is in effect, should be contacted and advised to use boiled or bottled water for patients to drink or rinse and for all hand washing.
- It is also recommended that the high/low speed turbines run dry and a hand syringe of boiled water or sterile saline be used for cooling/rinsing the tooth and/or oral tissues.
- Regular hand piece maintenance (i.e. boiling and sterilizing) should continue per the manufacturer's instructions.
- To avoid any potential risk of contamination from the water supply that could occur from and during inadvertent use of dentist equipment with contaminated water during the advisory, dentists are advised to turn off the water supply to their dental units and sinks. If this is not possible, covering or taping the controls or outlets may be indicated (e.g. triplex syringe, water dispenser, cavitron, etc.).

f) Water Vending Outlets (Includes Wine and Beer Vending)

Assess each system individually.

Appendix F

Summary Operational Procedures for Municipal Supplies Health-Related Chemical and Radiological Exceedance





© Crown copyright, Province of Nova Scotia, 2019
Guidelines for Monitoring Public Drinking Water Supplies
Part I - Municipal Public Drinking Water Supplies
Department of Lands and Forestry
February 2020
ISBN: 978-1-989654-24-8