

Nova Scotia Environment – System Assessment Report Terms of Reference

Checklist

2.0 Source Water Characterization

2.1 Source Description and Schematic*

| | | |
|---|--|--|
| 1. Describe the water source(s) used to meet water consumption demand. | | |
| 2. Describe any sources that are used as back-up supplies. | | |
| 3. The source(s) shall be identified on a map. | | |
| 4. Document what precautions are required for back-up supplies. | | |
| 5. If a back-up supply is intended to be used without precautions, verify that it meets the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> or if the back-up supply is a connection to an adjoining municipality, document the name of the municipal system. | | |

* For municipalities that purchase water from an adjoining system:

| | | |
|--|--|--|
| • Identify system connections on a map. | | |
| • Document the name of the municipal system(s) that water is purchased from. | | |
| • Proceed to Section 2.3. | | |

2.2 Microbial Risks

2.2.1 Surface Water Sources

| | | |
|--|--|--|
| 6. Summarize microbial risks and water quality variability of the surface water source(s). | | |
| 7. Submit raw water quality data for total coliforms and <i>E. coli</i> , as well as <i>Cryptosporidium</i> and <i>Giardia</i> if available, for the most recent calendar year as an Appendix. | | |

2.2.2 Groundwater Sources

| | | |
|--|--|--|
| 8. Verify that all individual wells have been classified in accordance with the <i>Protocol for Determining Groundwater Under the Direct Influence of Surface Water</i> . | | |
| 9. Summarize the GUDI status by individual well and identify at which step in the GUDI Protocol the well was categorized as GUDI or non-GUDI. | | |
| 10. For wells that are no longer in use, identify if the well has been properly decommissioned or is being maintained as a back-up well or monitoring well. | | |
| 11. For GUDI wells, complete Table A.1. | | |
| 12. Verify that MPA samples were taken in the spring following a rainfall event in accordance with Step 3 of the GUDI Protocol (e.g. if there is a 15 day time-of-travel, then the well shall be sampled 15 days after a surface water event). | | |
| 13. Inspect the site(s) to verify that there are no changes to the surrounding area to warrant re-classification of the well(s). | | |

| | | |
|---|--|--|
| 14. Recommend corrective action for wells: | | |
| <ul style="list-style-type: none"> For which MPA test results indicate a change in GUDI classification. | | |
| <ul style="list-style-type: none"> Where changes to the surrounding area have occurred to warrant re-classification of the well per the GUDI Protocol. | | |
| <ul style="list-style-type: none"> Where any other concerns are identified. | | |
| 15. Submit raw water quality data for total coliforms and <i>E. coli</i> bacteria for the most recent calendar year as an Appendix. | | |
| 16. For GUDI wells, submit any raw water quality data for <i>Cryptosporidium</i> or <i>Giardia</i> (if available) for the most recent calendar year as an Appendix. | | |

2.3 Chemical Risks

2.3.1 Disinfection By-Products

a) Trihalomethanes (THMs)

| | | |
|---|--|--|
| 17. Complete Table A.2 to summarize quarterly THM concentrations by sampling location. | | |
| 18. For non-GUDI systems that have had quarterly sampling reduced to annual sampling: | | |
| <ul style="list-style-type: none"> Note the approval date for this reduction in sampling frequency. | | |
| <ul style="list-style-type: none"> Modify Table A.2 to summarize annual results, including sampling date. | | |
| 19. If the locational running annual average for any sampling location exceeds the maximum acceptable concentration, corrective actions shall be recommended. | | |

| | | |
|---|--|--|
| 20. Verify that sampling locations are appropriate as follows: | | |
| <ul style="list-style-type: none"> • Are samples collected at the point(s) in the distribution system with the highest potential THM concentrations? | | |
| <ul style="list-style-type: none"> • Are an adequate number of sites sampled to represent exposure levels system-wide? | | |
| 21. THM sampling locations shall be identified on a map of the distribution system. | | |
| 22. Recommend sampling location/frequency changes if necessary. | | |

b) Haloacetic Acids (HAA5)

| | | |
|--|--|--|
| 23. Complete Table A.3 to summarize HAA5 concentrations by sampling location. | | |
| 24. For non-GUDI systems that have had quarterly sampling reduced to annual sampling: | | |
| <ul style="list-style-type: none"> • Note the approval date for this reduction in sampling frequency. | | |
| <ul style="list-style-type: none"> • Modify Table A.3 to summarize annual results, including sampling date. | | |
| 25. If the locational running annual average for any sampling location exceeds the maximum acceptable concentration, corrective actions shall be recommended. | | |
| 26. Verify that sampling locations are appropriate as follows: | | |
| <ul style="list-style-type: none"> • Are samples collected at the location(s) where historical data show the highest HAA5 concentrations? If historical data are not available, are HAA5 concentrations monitored in the middle and extremities of the distribution system to determine the highest concentrations? | | |
| <ul style="list-style-type: none"> • Are samples collected in areas where disinfectant residuals are significantly lower than the system average because of long residence time? | | |

| | | |
|---|--|--|
| <ul style="list-style-type: none"> • In systems with booster chlorination stations and water tanks/reservoirs, are HAA5 concentrations monitored downstream of these components? | | |
| <ul style="list-style-type: none"> • Are an adequate number of sites sampled to represent exposure levels system-wide. | | |
| 27. HAA5 sampling locations shall be identified on a map of the distribution system. | | |
| 28. Recommend sampling location/frequency changes if necessary. | | |

c) Other Disinfection By-Products (DBPs)

| | | |
|---|--|--|
| 29. Identify which other DBPs are required to be monitored and compare this to existing monitoring (see Table 1 in the Terms of Reference – page 10). | | |
| 30. Verify that sampling locations are appropriate. | | |
| 31. Sampling locations shall be identified on a map of the distribution system. | | |
| 32. Recommend sampling location/frequency changes if necessary. | | |
| 33. Summarize concentrations for the most recent calendar year. | | |
| 34. If any maximum acceptable concentration is exceeded, corrective actions shall be recommended. | | |

2.3.2 Lead and Corrosion Control

a) Lead

| | | |
|---|--|--|
| 35. Verify that sampling locations and frequencies for lead are appropriate as follows: | | |
| <ul style="list-style-type: none"> • Is an annual grab sample (flushed) collected during the warmest month at select distribution system sample point(s) as per the Approval to Operate? | | |
| <ul style="list-style-type: none"> • Are flushed samples collected at a point where water is consumed and at appropriate locations to identify problems per Health Canada's guidance on controlling corrosion? | | |
| <ul style="list-style-type: none"> • Are stagnant samples collected using first-draw sampling protocols per Health Canada's guidance on controlling corrosion? | | |
| 36. Lead sampling locations shall be identified on a map of the distribution system. | | |
| 37. Recommend sampling location/frequency changes if necessary. | | |
| 38. Summarize lead concentrations by sampling location and sample type (e.g. flushed or stagnant). | | |

b) Corrosion Control

| | | |
|---|--|--|
| 39. Review the corrosion control program to verify: | | |
| <ul style="list-style-type: none"> • Does one exist? | | |
| <ul style="list-style-type: none"> • Does it include monitoring of lead concentrations at points of consumption? | | |
| <ul style="list-style-type: none"> • Does it target areas where problems are expected? | | |
| <ul style="list-style-type: none"> • Does it include monitoring of parameters that provide the information that is needed to | | |

| | | |
|---|--|--|
| determine corrective measures that should be undertaken when elevated concentrations of lead, or other metals, are observed (e.g. pH, alkalinity, chloride to sulfate mass ratio, etc.)? | | |
| <ul style="list-style-type: none"> Does it include action limits that trigger follow-up? | | |
| 40. Summarize the water quality results of the corrosion control program for the most recent calendar year. | | |
| 41. Corrective actions shall be recommended if lead concentrations exceed the maximum acceptable concentration for flushed samples or the action limit for stagnant samples or other concerns are identified from the review of the corrosion control program. | | |
| <p>42. If a corrosion control program does not exist, document why, including water quality results that demonstrate non-corrosivity of the water, or recommend the need for a more comprehensive corrosion control program.</p> <p>Note: The Langelier Index is no longer considered an adequate measure of corrosivity. The submission of water quality results based solely on a positive Langelier Index will not be accepted as justification for not having a corrosion control program.</p> <p>Note: The Engineer is <u>not</u> required to develop a corrosion control program as part of the System Assessment Report.</p> | | |

2.3.3 Aluminum

| | | |
|--|--|--|
| 43. For facilities using aluminum-based coagulants, verify that monthly aluminum residuals are collected at the treatment facility and distribution system point(s). | | |
| 44. Compare the average of the 12 monthly samples collected at the treatment facility to the stipulated limit. | | |
| 45. If stipulated limits are exceeded, corrective actions shall be recommended. | | |

2.3.4 Guidelines for Canadian Drinking Water Quality*

| | | |
|--|--|--|
| 46. Verify that the full suite of health-related parameters (see Table A.4) have been analysed a minimum of once every five years for all raw water sources and treated water by: | | |
| <ul style="list-style-type: none"> • Document the sampling dates. | | |
| <ul style="list-style-type: none"> • Review the data to: | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Verify that sampling locations and frequencies are appropriate for cyanobacterial toxins and pesticides. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Identify if any maximum acceptable concentrations (MACs) have been exceeded. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Identify parameters with detectable concentrations. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Discuss any trends for parameters with detectable concentrations. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Include laboratory results from the last round of sampling as an Appendix. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Identify when the next round of sampling is scheduled to occur. | | |
| 47. If any MACs are exceeded, corrective actions shall be recommended. | | |
| 48. Recommend any changes to the monitoring program if sampling is inappropriate for cyanobacterial toxins, pesticides or other parameters, with enhanced monitoring recommended for parameters that have detectable concentrations. | | |
| 49. Recommend sampling location changes if necessary. | | |

* Municipalities that purchase water from an adjoining system may obtain water quality results from the owner of the source of treated water.

2.3.5 Guidelines for Monitoring Public Drinking Water Supplies*

| | | |
|---|--|--|
| 50. Verify that the parameters in the <i>Guidelines for Monitoring Public Drinking Water Supplies</i> (see Table A.5) have been analysed as required in all raw water sources and treated water by: | | |
| <ul style="list-style-type: none"> • Document the sampling dates. | | |
| <ul style="list-style-type: none"> • Review the data to: | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Verify that sampling locations and frequencies are appropriate. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Identify if any maximum acceptable concentrations (MACs) have been exceeded. | | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> • Identify any aesthetic parameters that may compromise disinfection or other critical processes. | | |
| <ul style="list-style-type: none"> • Discuss any water quality trends. | | |
| <ul style="list-style-type: none"> • Include laboratory results from the last round of sampling as an Appendix. | | |
| <ul style="list-style-type: none"> • Identify when the next round of sampling is scheduled to occur. | | |
| 51. If any MACs are exceeded, corrective actions shall be recommended. | | |
| 52. Recommend any changes to the monitoring program, sampling location/frequencies if necessary. | | |

* Municipalities that purchase water from an adjoining system may obtain water quality results from the owner of the source of treated water.

2.3.6 Source Water Protection Plan Monitoring*

| | | |
|---|--|--|
| 53. For utilities monitoring any other chemical parameters for source water protection purposes, summarize the parameters, their sampling frequency, and their measured concentrations. | | |
| 54. If concentrations are detectable or increasing, recommendations shall be identified. | | |
| 55. Review the source water protection plan monitoring program to verify: | | |
| <ul style="list-style-type: none"> • Does one exist? | | |
| <ul style="list-style-type: none"> • Does it include monitoring of parameters that provide the information that is needed to evaluate the effectiveness of the source water protection plan? | | |
| 56. Provide recommendations if necessary. | | |

* Not applicable for municipalities that purchase water from an adjoining system.

2.4 Filter Backwash Water*

| | | |
|---|--|--|
| 57. If water from the filter backwash treatment system is discharged upstream of the raw water intake, document the impact on the raw water source. | | |
| 58. If this discharge impacts the source, provide recommendations. | | |

* Not applicable for municipalities that purchase water from an adjoining system.

2.5 Source Quantity*

| | | |
|--|--|--|
| 59. Compile existing water withdrawal approvals and include copies of these as an Appendix. | | |
| 60. Complete Table A.6 to compare water withdrawals to approved limits. | | |
| 61. If water withdrawals are greater than approved limits, recommendations shall be identified, including water conservation measures. | | |
| 62. If water withdrawals are approaching approved limits and growth is forecast to increase withdrawals beyond approved limits, recommendations shall be identified. | | |

* Not applicable for municipalities that purchase water from an adjoining system.

2.6 Source Water Protection Plan*

| | | |
|---|--|--|
| 63. Identify the source water protection zone(s) on a map. | | |
| 64. Submit the source water protection zone(s) in GIS format to NSE. If zones are not available in GIS format, contact the Watershed Planner for your supply. | | |
| 65. Summarize the status of the source water protection plan and implementation schedule. | | |
| 66. Document the dates of the last two SWPP meetings. | | |
| 67. Note the status of meeting actions and/or SWPP deliverables. | | |
| 68. Make recommendations to address any concerns identified by the advisory committee or the source water protection planning process. | | |

* Not applicable for municipalities that purchase water from an adjoining system.

2.7 Conclusions and Recommendations

Refer to the Terms of Reference (pages 14-15).

3.1 Treatment Processes*

| | | |
|---|--|--|
| 69. Compile existing Approval(s) to Operate and include copies of these as an Appendix. | | |
|---|--|--|

* For municipalities that purchase water from an adjoining system:

| | | |
|--|--|--|
| <ul style="list-style-type: none"> • Document the name of the treatment facility. | | |
| <ul style="list-style-type: none"> • Proceed to Section 3.2. | | |

3.1.1 Treatment Process Schematic

| | | |
|---|--|--|
| 70. Provide a schematic of the treatment process from the source to treated water entering the distribution system. | | |
|---|--|--|

3.1.2 Turbidity Levels and Associated Criteria

a) Surface Water

| | | |
|---|--|--|
| 71. Verify that filtration technologies are meeting specified turbidity limits to receive the assigned log removal credits outlined in Table 1 of the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> by either Option 1 or Option 2. | | |
| 72. Submit individual filter effluent turbidity values for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2). | | |

| | | |
|--|--|--|
| 73. For facilities that do not meet stipulated turbidity limits, recommend corrective actions. | | |
| 74. Review the standard operating procedures (SOPs) for the filtration process to verify: | | |
| <ul style="list-style-type: none"> • Have control limits been set to alarm and notify operators of issues related to the filtration process? | | |
| <ul style="list-style-type: none"> • Have procedures been developed to remove a filter or membrane unit from service before turbidity exceeds stipulated values? | | |
| <ul style="list-style-type: none"> • Have procedures been implemented and communicated to all operations staff? | | |
| <ul style="list-style-type: none"> • Have procedures been documented in the operations manual? | | |
| 75. Inspect the filtration process to verify that continuous on-line turbidity measurements are taken for each individual filter at a minimum of once every five minutes. | | |
| 76. Inspect the on-line turbidimeters to ensure that: | | |
| <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? | | |
| <ul style="list-style-type: none"> • Are they are in good working order? | | |
| <ul style="list-style-type: none"> • Do they have a maintenance and quality assurance/calibration program? | | |
| 77. Inspect the filtration process to verify that there are a minimum of two filters. | | |
| 78. Document if the maximum day flow can be met with the largest filter out of service. Note: If the facility is unable to meet maximum day flows with the largest filter out of service, improvements to meet the Treatment Standards may be deferred to a future expansion provided SOPs are in place to minimize filter rate changes and spikes in turbidity which can result in filter breakthrough. | | |

| | | |
|---|--|--|
| 79. Make recommendations to address any concerns identified by the review of the filtration SOPs, inspection of on-line turbidimeters, and filter redundancy. | | |
|---|--|--|

b) GUDI Wells

| | | |
|---|--|--|
| 80. Verify that natural filtration is achieving specified turbidity limits to receive the assigned log removal credits outlined in Table 1 of the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> by either Option 1 or Option 2. | | |
| 81. Submit individual GUDI well turbidity values for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2). | | |
| 82. For GUDI wells that do not meet stipulated turbidity limits, contact NSE to determine what requirements shall apply. | | |
| 83. Inspect the site(s) to verify that continuous on-line turbidity measurements are taken for each individual GUDI wellhead at a minimum of once every five minutes. | | |
| 84. Inspect the on-line turbidimeters to ensure that: | | |
| <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? | | |
| <ul style="list-style-type: none"> • Are they are in good working order? | | |
| <ul style="list-style-type: none"> • Do they have a maintenance and quality assurance/calibration program? | | |
| 85. Make recommendations to address any concerns identified by the inspection of the on-line turbidimeters. | | |

c) Non-GUDI Wells

| | | |
|--|--|--|
| 86. Summarize turbidity levels in non-GUDI wells by either Option 1 or Option 2. | | |
| 87. Note if measurements are by daily grab samples or continuous on-line turbidimeters. | | |
| 88. Submit non-GUDI system turbidity for individual wells or combined flow for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2). | | |
| 89. For non-GUDI wells that do not meet stipulated turbidity limits, contact NSE to determine what requirements shall apply. | | |
| 90. Where continuous measurements are taken, inspect the on-line turbidimeters to ensure that: | | |
| <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? | | |
| <ul style="list-style-type: none"> • Are they are in good working order? | | |
| <ul style="list-style-type: none"> • Do they have a maintenance and quality assurance/calibration program? | | |
| 91. Where grab samples are taken, inspect the monitoring equipment, SOPs, maintenance and quality assurance/calibration program to ensure equipment is in good working order and measurements are appropriate. | | |
| 92. Make recommendations to address any concerns identified by the inspection of on-line turbidimeters or grab sample protocols. | | |

3.1.3 Membrane Filtration – Additional Requirements

| | | |
|---|--|--|
| 93. Complete Table B.1 to verify that each individual membrane treatment unit that is used for pathogen reduction credits is free of any integrity breaches and determine its log removal value using pressure-based testing. | | |
| 94. Make recommendations to address any concerns identified. | | |
| 95. For facilities with integrated membrane systems, summarize the process used to verify the rejection rate remains adequate for organics removal. | | |
| 96. Make recommendations to address any concerns identified. | | |

3.1.4 Primary Disinfection

| | | |
|---|--|--|
| 97. Document how many inactivation log credits are required by disinfection by target microorganism (e.g. protozoa and/or viruses). | | |
| 98. Discuss how disinfection is achieved (e.g. chemical disinfectants, UV or both). | | |

a) Chemical Disinfection (CT Concept)

| | | |
|--|--|--|
| 99. Where chemical disinfectants are used, provide a schematic of the primary disinfection process including, but not limited to: | | |
| <ul style="list-style-type: none"> • Tank(s) dimensions. | | |
| <ul style="list-style-type: none"> • Baffling configuration and assumed baffling factor. | | |
| <ul style="list-style-type: none"> • Water level operating range, highlighting the low level. | | |
| <ul style="list-style-type: none"> • Disinfection type (e.g. free chlorine, chlorine dioxide, ozone). | | |
| <ul style="list-style-type: none"> • Minimum disinfectant concentration at the CT control point. | | |
| <ul style="list-style-type: none"> • Minimum water temperature. | | |
| <ul style="list-style-type: none"> • Maximum pH of the water for free chlorine or optimum pH for chlorine dioxide or ozone. | | |
| <ul style="list-style-type: none"> • Maximum flow and minimum retention time - if the tank used to achieve CT is subject to water level fluctuations, verify if the inflow/outflow represents the maximum flow condition. | | |
| 100. Calculate the design CT. | | |
| 101. Verify that operational conditions remained within the design range for achieving CT at all times during the most recent calendar year. | | |
| 102. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that CT was calculated during every such event. | | |
| 103. Make recommendations to address any concerns identified. | | |

b) UV Disinfection (IT Concept)

| | | |
|--|--|--|
| 104. Where UV disinfection is used, provide a schematic of the primary disinfection process including, but not limited to: | | |
| <ul style="list-style-type: none"> • Unit manufacturer and model. | | |
| <ul style="list-style-type: none"> • Validation standard. | | |
| <ul style="list-style-type: none"> • Maximum flow. | | |
| <ul style="list-style-type: none"> • Minimum intensity at the end of lamp life. | | |
| <ul style="list-style-type: none"> • Minimum transmittance at the end of lamp life. | | |
| <ul style="list-style-type: none"> • Correction for water temperature. | | |
| <ul style="list-style-type: none"> • Maximum concentrations for water quality parameters that promote fouling (e.g. iron, manganese, hardness). | | |
| <ul style="list-style-type: none"> • Sleeve cleaning method. | | |
| 105. Verify that the unit has been designed to deliver a UV dose of 40 mJ/cm ² . | | |
| 106. Verify that the following conditions were met at all times during the most recent calendar year: | | |
| <ul style="list-style-type: none"> • Was the intensity above the minimum required? | | |
| <ul style="list-style-type: none"> • Was the flow below the maximum allowed? | | |
| <ul style="list-style-type: none"> • Was the transmittance above the minimum required? | | |

| | | |
|---|--|--|
| 107. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that IT was calculated during every such event. | | |
| 108. Provide recommendations to address any concerns identified. | | |

c) Redundancy, Continuous Monitoring and Alerting

| | | |
|--|--|--|
| 109. Inspect the primary disinfection process to verify the following: | | |
| <ul style="list-style-type: none"> • Are there a minimum of two primary disinfection units? | | |
| <ul style="list-style-type: none"> • Are the primary disinfection units sized to meet maximum day demand with one unit out of service? | | |
| <ul style="list-style-type: none"> • Is on-line monitoring of the primary disinfection process in place with measurements taken at least once every five minutes? | | |
| <ul style="list-style-type: none"> • Have control limits been set to alarm and notify operators that the primary disinfection process is not working properly? | | |
| <ul style="list-style-type: none"> • Are protocols in place to prevent inadequately disinfected water from entering the distribution system? | | |
| 110. Inspect the on-line instrumentation to ensure that: | | |
| <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure chlorine concentrations? | | |
| <ul style="list-style-type: none"> • Are they are in good working order? | | |
| <ul style="list-style-type: none"> • Do they have a maintenance and quality assurance/calibration program? | | |
| 111. Provide recommendations to address any concerns identified. | | |

d) Standard Operating Procedures

| | | |
|---|--|--|
| 112. Review the standard operating procedures for the disinfection process to verify: | | |
| <ul style="list-style-type: none"> • Do they specify the design ranges for achieving CT (e.g. temperature, disinfectant residual, flow, pH) or IT (e.g. intensity, flow, transmittance)? | | |
| <ul style="list-style-type: none"> • Do they include notification and response procedures when operational conditions are outside CT or IT design ranges? | | |
| <ul style="list-style-type: none"> • Do they include procedures to ensure the disinfection process is working properly? | | |
| <ul style="list-style-type: none"> • Do they include response procedures when the disinfection process is not working properly? | | |
| <ul style="list-style-type: none"> • Have they been implemented and communicated to all operations staff? | | |
| <ul style="list-style-type: none"> • Have they been documented in the operations manual? | | |
| 113. Provide recommendations to address any concerns identified. | | |

3.1.5 Secondary Disinfection

| | | |
|---|--|--|
| 114. Describe the secondary disinfection process. | | |
| 115. Inspect the secondary disinfection process to verify the following: | | |
| <ul style="list-style-type: none"> • Are on-line continuous chlorine residual monitors in place to measure chlorine residual entering the distribution system at least once every five minutes? | | |
| <ul style="list-style-type: none"> • Are the on-line chlorine residual monitors in good working order? | | |
| <ul style="list-style-type: none"> • Is there a maintenance and quality assurance/calibration program in place? | | |
| 116. Where free chlorine is used for both primary and secondary disinfection, refer to Section 3.1.4 and note if the chlorine dose is controlled by CT (primary disinfection) or distribution system residual maintenance (secondary disinfection). | | |
| 117. Where UV light is used for primary disinfection to receive protozoa inactivation credits, calculate the design CT for virus inactivation credits. | | |
| 118. Where UV light is used for primary disinfection to receive protozoa inactivation credits, verify that operational conditions remained within the design range for achieving CT for virus inactivation at all times during the most recent calendar year. | | |
| 119. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that CT was calculated during every such event. | | |
| 120. Provide recommendations to address any concerns identified. | | |

3.1.6 Other Critical Processes

| | | |
|--|--|--|
| 121. Evaluate and inspect other critical processes against established standards and guidelines. | | |
| 122. Recommend corrective actions where necessary. | | |

3.1.7 Waste Streams

a) Filter-to-Waste

| | | |
|---|--|--|
| 123. Describe the filter-to-waste process. | | |
| 124. For chemically-assisted filtration, verify that turbidity is less than or equal to 0.2 NTU before returning a filter to service. | | |
| 125. Recommendations shall be identified, if necessary, to meet the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> . | | |

b) Filter Backwash Water

| | | |
|---|--|--|
| 126. Complete Table B.2* to summarize the location of the filter backwash water discharge and its quality. | | |
| 127. If the water quality does not meet the discharge criteria stipulated in the utility's approval to operate, recommendations shall be identified to meet the requirements specified in Section 4.3.1* of the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> . | | |

* Where backwash water discharges into a municipal wastewater system, modify Table B.2 to identify any issues related to meeting Section 4.3.1(b) of the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*.

c) Other Waste Streams

| | | |
|---|--|--|
| 128. Review other waste streams and verify that they are being managed appropriately. | | |
| 129. Recommendations shall be identified where necessary. | | |

3.2 Distribution Water Quality

3.2.1 Chlorine Residual Levels

| | | |
|---|--|--|
| 130. Review distribution system chlorine residuals for the most recent calendar year available. | | |
| 131. Where residuals are routinely less than 0.20 mg/L where free chlorine is used (or 1.0 mg/L combined chlorine for chloraminated systems), corrective actions shall be recommended. | | |
| 132. Inspect all distribution water storage tanks to verify that on-line continuous chlorine residual monitors are in place to measure chlorine residual at the storage tank outlet at least once every five minutes. | | |
| 133. Inspect the on-line chlorine residual monitors to ensure that they are in good working order and that a maintenance and quality assurance/calibration program is in place. | | |
| 134. Recommend corrective actions where necessary. | | |

3.2.2 Microbiological Water Quality

| | | |
|---|--|--|
| 135. Review total coliforms and <i>E.coli</i> results for the most recent calendar year available. | | |
| 136. The presence of bacteria in the distribution system shall be discussed and recommendations identified where necessary. | | |

| | | |
|--|--|--|
| 137. Verify that sampling locations and frequencies meet the requirements of the <i>Guidelines for Canadian Drinking Water Quality</i> and the <i>Guidelines for Monitoring Public Drinking Water Supplies</i> , including re-sampling after the presence of bacteria is detected. | | |
| 138. Sampling locations shall be identified on a map of the distribution system. | | |
| 139. Recommend sampling location/frequency changes if necessary. | | |

3.2.3 Turbidity

| | | |
|---|--|--|
| 140. Review <u>distribution system</u> turbidity results for the most recent calendar year available. | | |
| 141. Verify that a protocol exists for investigating the cause of turbidity values above 5 NTU. | | |
| 142. Values above 5 NTU shall be discussed and recommendations identified where necessary. | | |

3.2.4 Other Distribution System Monitoring/Programs

| | | |
|--|--|--|
| 143. Review any other distribution system monitoring or programs that are in place to deal with threats to distribution system integrity, including but not limited to infrastructure age, watermain breaks, leak detection, pressure transients, etc. | | |
| 144. Provide recommendations where necessary. | | |

3.3 On Site Inspection

| | | |
|---|--|--|
| 145. Conduct an on site inspection to evaluate treatment processes, as well as other facilities and equipment as per the requirements outlined in the Terms of Reference (see pages 27-28). | | |
|---|--|--|

3.4 Conclusions and Recommendations

Refer to the Terms of Reference (pages 28-29).

4.0 Review of Operations, Maintenance, Monitoring and Management

4.1 Operations and Maintenance

| | | |
|--|--|--|
| 146. Review the comprehensive operations manual to verify: | | |
| • Does one exist? | | |
| • Is it current and up to date? | | |
| • Does it include SOPs, emergency notification procedures and contingency plans? | | |
| • Is it available on site? | | |
| • Is operations staff aware of its contents? | | |
| 147. Evaluate the procedures an operator follows to identify any problems with the process, determine the changes needed to correct the problem and how adjustments to the process are approved and performed as needed. | | |
| 148. Verify that a maintenance program exists and is adequate to ensure the long-term viability of the municipal drinking water system, including distribution system components. | | |
| 149. Recommendations shall be identified where necessary. | | |

4.2 Monitoring and Reporting

| | | |
|--|--|--|
| 150. Review the annual monitoring program to verify: | | |
| <ul style="list-style-type: none"> • Does one exist? | | |
| <ul style="list-style-type: none"> • Is it current and up to date? | | |
| <ul style="list-style-type: none"> • Does it include compliance monitoring, QA/QC requirements, process monitoring, response monitoring, source water characterization and protection monitoring and any other applicable monitoring? | | |
| <ul style="list-style-type: none"> • Does it include action levels for responding to treatment issues? | | |
| <ul style="list-style-type: none"> • Is it available on site? | | |
| <ul style="list-style-type: none"> • Is operations staff aware of its contents? | | |
| 151. Identify the laboratories being used for water quality analyses. | | |
| 152. Verify that the municipal water utility is operating in accordance with the <i>Policy on Acceptable Certification of Laboratories</i> . | | |
| 153. Review reporting requirements and verify that the utility has complied with the immediate, annual and ad hoc reporting requirements outlined in Appendix G of the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> . | | |
| 154. Review the most recent annual report and identify any concerns in the System Assessment Report. | | |
| 155. Recommendations shall be identified where necessary. | | |

4.3 Management

| | | |
|--|--|--|
| 156. Review the number of certified operators and back-up personnel to verify that the municipal water utility is operating in accordance with Part I of the <i>Water and Wastewater Facilities and Public Drinking Water Supplies Regulations</i> . | | |
| 157. Complete Table C.1 to identify the operator(s) in overall direct responsible charge (ODRC) and summarize what protocols are in place during the absence of the operator(s) in ODRC. Note: The ODRC operator(s) must sign Table C.1. | | |
| 158. Review the water quality goals that the utility has and evaluate the plan(s) the utility has to accomplish or maintain these goals. | | |
| 159. Recommendations shall be identified where necessary. | | |

4.4 Conclusions and Recommendations

Refer to the Terms of Reference (page 31).

5.0 Ability to Comply

| | | |
|---|--|--|
| 160. Summarize conclusions and identify all recommendations necessary to meet current environmental standards and the <i>Nova Scotia Treatment Standards for Municipal Drinking Water Systems</i> . | | |
| 161. Include preliminary cost estimates and an implementation schedule to address the above requirements. Costs shall be presented and prioritized with respect to public health risks. Note: If the corrective action plan submitted to NSE (due by October 1, 2013) varies from the risk-based approach documented in the System Assessment Report, written justification shall be included in the corrective action plan for varying the priority. | | |

| | | |
|--|--|--|
| 162. Obvious problems associated with the municipal drinking water system that jeopardize treated water quality to the point that it no longer meets the health protection standards adopted by NSE are to be highlighted in the System Assessment Report. | | |
|--|--|--|

6.0 Report Preparation

| | | |
|---|--|--|
| 163. Three (3) copies of the System Assessment Report are to be submitted to NSE by April 1, 2013. Note: Refer to the Terms of Reference (pages 32-33) for a sample Table of Contents for the report. | | |
| 164. Engineer's Declaration | | |

For more information, contact:

Judy MacDonald, P. Eng.
 Supervisor, Drinking Water Program
 Tel: (902) 424-2378
 Fax: (902) 424-0501
 Email: macdonjx@gov.ns.ca

