

**Manitoba Water
Stewardship**

**Terms of Reference for Assessment of
Water System Infrastructure and Water Supply
Sources for Public Water Systems**

Date: July 2008

**Prepared for
Office of Drinking Water
Prepared by**

Manitoba 

TERMS OF REFERENCE

FOR

**ASSESSMENT OF WATER SYSTEM
INFRASTRUCTURE AND WATER SUPPLY
SOURCES**

For Public Water Systems

Approval Guideline ODW-AG-02

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Table of Contents

1.0	DEFINITIONS	1
2.0	OBJECTIVES	2
3.0	GENERAL REQUIREMENTS.....	2
4.0	COMPILATION OF CERTIFICATES, PERMITS AND LICENCES	3
5.0	CHARACTERIZATION OF THE RAW WATER SUPPLY SOURCE(S).....	3
6.0	DESCRIPTION OF THE WATER SYSTEM AND OPERATIONS	4
7.0	CHARACTERIZATION OF THE TREATED WATER.....	4
8.0	ASSESSMENT OF THE POTENTIAL FOR MICROBIOLOGICAL, CHEMICAL AND PHYSICAL CONTAMINATION.....	5
9.0	ASSESSMENT OF PHYSICAL WORKS ASSOCIATED WITH THE WATER SYSTEM	6
10.0	PREPARATION AND SUBMISSION OF A REPORT	7

**TERMS OF REFERENCE
FOR
ASSESSMENT OF WATER SYSTEM INFRASTRUCTURE AND
WATER SUPPLY SOURCES - FOR PUBLIC WATER SYSTEMS**

April 2004

1.0 DEFINITIONS

The following definitions apply throughout this document:

AWWA – means the “American Water Works Association” and its associated Standards, Manuals, White Papers and Policies.

Domestic Purposes – means the use of water for personal hygiene, drinking, preparing food or washing dishes or other items that come into contact with food, or other purposes prescribed by regulation.

DWS Act – means the “Drinking Water Safety Act” assented to August 9, 2002 and as amended from time to time.

Engineer – means a Professional Engineer as defined in the *Engineering and Geoscientific Professions Act* and who;

(a) is competent by virtue of training, and experience in engineering relating to drinking water supplies, to engage in practices that fulfil the requirements of these Terms of Reference, and

(b) is not an employee of the Owner of the Water System being reviewed, and

(c) has been contracted by the Owner of the Water System to prepare a System Assessment Report to determine whether the Water System is capable of achieving current quality and environmental standards in accordance with these Terms of Reference.

GCDWQ – means the latest version of the “Guidelines for Canadian Drinking Water Quality”, and as amended from time to time.

ODW – means the “Office of Drinking Water”.

Owner – means that person who is responsible for the ongoing operation of the Water System, or in charge of managing that operation, and if the Water System, or part of it, is owned by more than one person or is jointly owned, includes all of those Owners.

Private Water System – means a Water System that supplies water only to one private residence; or despite supplying water to commercial premises or to more than one private residence, is designated under clause 2(a) under the DWS Act as a Private Water System.

Provincial Standards – means the health related parameters as described in the Drinking Water Quality Standards Regulation in force under the Drinking Water Safety Act.

Public Water System – means a Water System that has 15 or more service connections; or has fewer than 15 service connections, but is designated under clause 2(b) under the DWS Act as a Public Water System.

System Assessment Report or Report – means the “Assessment of Water System Infrastructure and Water Supply Sources” referenced in Section 9 of the DWS Act and the deliverable product of these Terms of Reference.

Semi-Public Water System – means a Water System that is not a Public Water System or a Private Water System.

SWTR – means “Long Term 1 Enhanced Surface Water Treatment Rule” promulgated in January 2002 by the US Environmental Protection Agency, and as amended from time to time.

Ten State Standards – means the latest version of the “Recommended Standards for Water Works” as issued by the ‘Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers’, and as amended from time to time.

Water System – means a well, or a device or structure or an assemblage of devices and structures, used or intended to be used for the production, treatment, storage and/or delivery of potable water for Domestic Purposes.

2.0 OBJECTIVES

These Terms of Reference have been prepared in support of Section 9, ASSESSMENTS OF WATER SYSTEM INFRASTRUCTURE AND WATER SUPPLY SOURCES, of the DWS Act. The System Assessment Reports are to be completed by a Professional Engineer, licensed to practice and consult in the Province of Manitoba, with applicable experience relating to drinking water supplies.

The objective of the Report is to carry out an onsite evaluation to identify, analyse and mitigate any potential adverse health risks and environmental impacts associated with the Water System in a “source to tap” methodology. It is also to determine whether the Water System’s source, facilities, equipment and operations are effective in producing safe drinking water, and meet the regulations in force under the Public Health Act and the DWS Act. The level of effort and depth of the Report should reflect the Water System size, complexity and risks.

For regional systems where a supply, treatment and transmission water system may supply several separate storage and distribution system(s) owned by others, a System Assessment Report is required from each Owner of these system(s). The Owner of a system receiving water from another system need not include an assessment of that other system, as the Owner of the other system will be responsible for that assessment. Similarly, the Owner of a regional supply system is not responsible for assessing the distribution systems owned by others.

3.0 GENERAL REQUIREMENTS

The Engineer preparing the Report is required to carry out an onsite evaluation and to establish contact with the regional Drinking Water Officer. The Report is to identify any risks to public health and shall make recommendations as necessary for operational and physical improvements that should be implemented to mitigate against these risks.

The Report must include:

- 3.1 A compilation of existing Certificate(s) of Approval, Permits and Licences for the Water System.
- 3.2 A review of previous applicable studies and reports relating to the Water System.
- 3.3 A characterization of the raw water supply source(s), and a description of any source water protection measures being implemented.
- 3.4 A description of the Water System and operations.

- 3.5 A characterization of the treated water.
- 3.6 An assessment of the potential for microbiological, chemical and physical contamination.
- 3.7 An assessment of the physical works associated with the Water System.

4.0 COMPILATION OF CERTIFICATES, PERMITS AND LICENCES

- 4.1 The Engineer shall compile available Certificate(s) of Approval, Permit(s) and Licence(s) for the Water System from the Owner, and include a copy of these as an Appendix to the Report.
- 4.2 The Engineer shall prepare a listing of available Certificates, Permits and Licences in chronological order summarizing the certificate number, a brief description of the works approved for each Certificate, Permit and Licence, and a summary of terms and conditions.

5.0 CHARACTERIZATION OF THE RAW WATER SUPPLY SOURCE(S).

- 5.1 The Engineer shall characterize the raw water of each individual source of the Water System's raw water supply, including any back-up supplies. The Engineer shall utilize the source raw water sampling and analysis records available from the Owner and the ODW, and any additional sampling and analysis that may need to be undertaken for a characterization appropriate to the source. A copy of these records is to be included as an Appendix to the Report.
- 5.2 The Engineer shall, if applicable, provide a preliminary determination of whether a groundwater supply is under the direct influence of surface water based on available evidence, and indicate the need for additional studies if required.
- 5.3 Based on the raw water characterization, the Engineer shall:
 - Determine raw water quality conformance to the GCDWQ and the Provincial Standards, whichever is the most stringent, and any parameters listed in the Operating Licence (where a licence has been issued).
 - Identify parameters that may impact treatment of the water, and influence operation of the system.
 - Evaluate the potential for formation of trihalomethanes (THMs) based on levels of organic precursors in the raw water (ex: TOC levels).
 - Determine the potential for formation of other disinfection by-products (DBPs).
 - Identify any emerging issues that may impact the water source.
 - Identify treatment options that may be necessary to assure conformance to the Provincial Standards, and any parameters listed in the Operating Licence.
 - The characterization shall also include an evaluation of any source water protection measures being carried out.

6.0 DESCRIPTION OF THE WATER SYSTEM AND OPERATIONS

- 6.1 The Engineer shall prepare a description of the Water System, including works for the collection, production, treatment, storage and/or delivery of potable water.
- 6.2 This description shall be in sufficient detail to permit the ODW to utilize this description for an Operating Licence for the Water System.
- 6.3 The description of works shall also include a schematic process flow diagram of the Water System with process units and equipment identified, as well as points of connection to the distribution system.
- 6.4 This description shall include the types, number and sizes of all process units and equipment including waste stream treatment and disposal facilities, and shall include critical process design parameters, such as, but not limited to: intake velocity, mixing rates in rapid mix and flocculation tanks, surface settling rates and retention times in settling tanks, filtration and backwash rates in filters, chemical feed rates and disinfection concentration/time (CT) factors.

Particular attention is required in describing the complete disinfection system. CT calculations must be included for worst case conditions between the application point and the first user. Disinfection profiling shall be based on the methodology and tables from the GCDWQ, or the SWTR where not covered in the GDCWQ.
- 6.5 The Engineer shall also include a summary of the Water System's log reductions for pathogen removal based on the GCDWQ, or the SWTR where not covered in the GDCWQ. All Water Systems that are supplied by surface water, or groundwater under the direct influence (GUDI) of surface water, shall ensure the following minimum reduction in pathogen levels: Minimum 3-log reduction or inactivation in *cryptosporidium*; minimum 3-log reduction or inactivation in *giardia*; and minimum 4-log reduction or inactivation in *viruses*. Higher source water contamination levels may require greater log reductions.
- 6.6 The assessment of the physical works shall include a review of all on-line instrumentation in regards to their installation and operation.
- 6.7 The Report shall include an evaluation of the Water System's long term sustainability, reliability of operation, consistency of quality, remaining service life and short- and -long-term upgrading needs.
- 6.8 The Engineer shall provide a brief review of operations, including documenting number of employees, level of certification of employees and the number of hours on average each employee spends on operating the Water System.
- 6.9 The Report shall include a summary of water production and consumption quantities for a minimum three-year period.

7.0 CHARACTERIZATION OF THE TREATED WATER

- 7.1 The Engineer shall characterize the treated water at the treatment facility and in the distribution system. The Engineer shall utilize the treated water sampling and analysis records available from the Owner and the ODW, and any additional sampling and analysis that may need to be undertaken for a characterization of the treated water. A copy of these records is to be included as an Appendix to the Report.

- 7.2 Based on treated water characterization, the Engineer shall:
- Determine treated water quality conformance to the GCDWQ and the Provincial Standards, whichever is the most stringent, and any parameters listed in the Operating Licence (where a licence has been issued).
 - Evaluate the potential for formation of trihalomethanes (THMs) in the treated water based on existing THM results and levels of organic precursors. If no actual THM results are available, submit a minimum of one preserved sample from a remote service area within the water distribution system for THM testing. Depending on this evaluation, consider the need for further characterization of the treated water (ex: DOC levels) or additional distribution system THM tests.
 - Determine the potential for formation of other disinfection by-products (DBPs).
 - Identify any emerging issues that may impact the treated water quality.

8.0 ASSESSMENT OF THE POTENTIAL FOR MICROBIOLOGICAL, CHEMICAL AND PHYSICAL CONTAMINATION

- 8.1 The Engineer shall undertake a review of the complete Water System to assess the potential for contamination using the following:
- A review of the intake/well physical works, treatment works including storage facilities for the purpose of identifying potential sources and pathways of contamination to the physical works. Items to be reviewed include, but are not limited to: well head protection, watershed land uses, agricultural/economic/ industrial activities, waste treatment, potential developments, natural protective features and known threats.
 - A review of available records of treated water quality testing for parameters that exceeded the Provincial Standards over the last five years.
 - A review of any source water protection activities that are being implemented to assess whether they are sufficient to maintain consistent source water quality.
- 8.2 The Engineer shall undertake a review of the results of bacteriological and disinfection residual sampling and analyses taken from the distribution system for the purpose of identifying locations within the distribution system which may need further assessment as potential sources of bacterial contamination or respecting disinfection residual enhancements using the following:
- A review of available records of microbiological testing in the distribution system over the last five years.
 - A review of the distribution system details, including service connections. The review shall include a review of pipe materials, age of system, lead connections, known watermain breaks and suspected deficiencies.
- 8.3 The Engineer shall review cross connection control and backflow prevention programs, flushing/swabbing programs and any start-up and shutdown protocols, where applicable, and make recommendations for improvements that may be required to mitigate against the potential for microbiological, chemical and physical contamination of the drinking water.

- 8.4 The Engineer shall review the standard operating procedures and/or contingency plans for ensuring distribution system water quality during disruptions in system integrity. The Engineer shall also identify any emergency contingency plans that exist and if they are regularly reviewed and practiced by staff.
- 8.5 Should, at any time during the assessment, the Engineer discover direct sources of microbiological contamination, or malfunctioning disinfection equipment, or any system directly relating to microbiological contamination, the Engineer shall immediately notify the regional Drinking Water Officer, the ODW and the Owner.
- 8.6 Should, at any time during the assessment, the Engineer discover a situation where workplace safety is at risk, the Engineer shall immediately notify the Workplace Health and Safety Officer, the regional Drinking Water Officer, the ODW and the Owner.
- 8.7 The Engineer shall make recommendations as necessary for operational and physical improvements that should be implemented to mitigate against the potential for contamination.

9.0 ASSESSMENT OF PHYSICAL WORKS ASSOCIATED WITH THE WATER SYSTEM

- 9.1 The Engineer shall review the existing Water System with particular attention to works necessary to ensure the robustness of the system utilising the multiple barrier concept. The review should consider documents such as AWWA and Ten State Standards as they pertain to water quality and safety.
- 9.2 The Engineer shall determine if the Water System, including disinfection procedures, is being operated in compliance with the Public Health Act, the DWS Act and all regulations in force under these Acts.
- 9.3 The Engineer shall review the existing building(s) (super- and sub-structure, reservoirs, water tower), mechanical, HVAC, electrical and control systems as to their general condition and potential to affect water quality or reliability of service.
- 9.4 The Engineer shall make recommendations as necessary for operational and physical improvements that should be implemented to achieve compliance with regulations.

10.0 PREPARATION AND SUBMISSION OF A REPORT

- 10.1 The Engineer shall prepare a written Report outlining the findings and recommendations that shall be relied upon by the ODW in support of further decisions to be made by the ODW. The completed Report shall be to the satisfaction of the ODW.
- 10.2 Five (5) bound copies of the Report shall be submitted to the Owner. The Report shall also be submitted electronically in PDF format on compact disk. All supporting documents are to be digitized/scanned, and included in the PDF file.
- 10.3 The Engineer shall complete Form ODW-AF-01B and Form ODW-AF-01C and attach copies to each Report.
- 10.4 The Owner shall review the Report and forward three (3) bound copies and a PDF format copy on compact disk to the ODW (Approvals Engineer, 1007 Century Street, Winnipeg MB R3H 0W4) with the completed Form ODW-AF-01A.
- 10.5 Within one year of the completion of the Report, the Owner shall submit to the ODW an action plan detailing the tasks to be taken to address any deficiencies noted in the Report, and the schedule of implementation. **The Owner shall correct any critical issues identified in the Report as posing an immediate health risk within 30 days, or within a timeline approved by the ODW.**

SAMPLE TABLE OF CONTENTS

0.0	EXECUTIVE SUMMARY	i
1.0	CERTIFICATES, PERMITS AND LICENCES	
1.1	OPERATING LICENCE(S)	1
1.2	CERTIFICATE(S) OF APPROVAL	1
1.3	WATER RIGHTS LICENCE(S)	2
1.4	ENVIRONMENTAL ACT LICENCE(S)	2
2.0	RAW WATER SUPPLY SOURCE CHARACTERIZATION	
2.1	RAW WATER SOURCE	3
2.1.1	Primary Raw Water Source	3
2.1.2	Back-up Raw Water Source	3
2.2	DESCRIPTION OF SOURCE PROTECTION MEASURES	4
2.3	CHARACTERIZATION OF RAW WATER IN TERMS OF CONFORMANCE TO PROVINCIAL STANDARDS	4
2.4	IDENTIFICATION OF PARAMETERS WHICH MAY IMPACT TREATMENT AND INFLUENCE OPERATION OF THE SYSTEM	5
2.5	IDENTIFICATION OF TREATMENT WHICH MAY BE NECESSARY TO ASSURE CONFORMANCE	5
2.6	ASSESSMENT OF THE POTENTIAL FOR FORMATION OF THMs AND OTHER DISINFECTION BY-PRODUCTS	6
3.0	DESCRIPTION OF THE WATER SYSTEM AND OPERATIONS	
3.1	BACKGROUND	7
3.2	DESCRIPTION OF THE WATER SYSTEM	
3.2.1	Detailed Description	7
3.2.2	Summary of the Facility’s “log credits”	8
3.2.3	Disinfection CT Calculations	8
3.3	REVIEW OF MONITORING EQUIPMENT	9
3.4	SUMMARY OF WATER SYSTEM’S SUSTAINABILITY AND RELIABILITY	10
3.5	SUMMARY OF OPERATOR AND STAFF CERTIFICATION LEVELS	11
3.6	SUMMARY OF WATER PRODUCTION AND CONSUMPTION RATES	12

4.0	TREATED WATER CHARACTERIZATION	
4.1	CHARACTERIZATION OF TREATED WATER IN TERMS OF CONFORMANCE TO PROVINCIAL STANDARDS	13
4.2	EVALUATION OF THMs AND OTHER DISINFECTION BY-PRODUCTS IN THE TREATED WATER	14
5.0	ASSESSMENT OF THE POTENTIAL FOR MICROBIOLOGICAL, CHEMICAL AND PHYSICAL CONTAMINATION	
5.1	ASSESSMENT OF THE POTENTIAL FOR CONTAMINATION AT THE WATER SOURCE	15
5.1.1	Site Visit and Inspection Findings	15
5.1.2	Review of Bacteriological Data	16
5.2	ASSESSMENT OF THE POTENTIAL FOR CONTAMINATION IN THE TREATMENT PROCESS.....	17
5.2.1	Inspection Findings and System Details.....	17
5.3	ASSESSMENT OF THE POTENTIAL FOR CONTAMINATION IN THE DISTRIBUTION SYSTEM	18
5.3.1	Inspection Findings and System Details.....	19
5.3.2	Review of Bacteriological Data	21
5.3.3	Review of Monitoring Programs	21
5.3.3	Review of Cross Connection and Backflow Prevention Programs.....	22
5.3.4	Review of Emergency Contingency Plans	22
5.4	SUMMARY OF FINDINGS AND RECOMMENDATIONS FOR THE MITIGATION OF THE POTENTIAL FOR CONTAMINATION.....	23
6.0	ASSESSMENT OF PHYSICAL WORKS ASSOCIATED WITH THE WATER SYSTEM	
6.1	SUMMARY OF PHYSICAL WORKS.....	24
6.2	ABILITY TO COMPLY WITH REGULATIONS.....	27
6.3	RECOMMENDATIONS FOR IMPROVEMENTS FOR COMPLIANCE	28
7.0	SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.....	30

APPENDICES

APPENDIX A -	DRAWINGS AND FIGURES
APPENDIX B -	COPIES OF CERTIFICATES AND LICENCES
APPENDIX C -	RAW WATER QUALITY DATA
APPENDIX D -	TREATED WATER QUALITY DATA

**NOTICE OF COMPLETION OF AN ASSESSMENT OF WATER SYSTEM INFRASTRUCTURE
AND WATER SUPPLY SOURCES FOR A PUBLIC WATER SYSTEM**

TO BE COMPLETED BY THE OWNER:		Date of Report: <i>(yyyy/mm/dd)</i>
Name of Water System:		Community Code:
Category of Water System:	Raw Water Source: (Surface/Groundwater/GUDI/Combined)	
Location of Water System:		Population Served:
Water System Owner Name:	Telephone:	Fax:
Water System Owner Address:		
OPERATING LICENCE NUMBER AND DATE OF ISSUE (Where available) :		
As issued under the Drinking Water Safety Act		
<u>Operating Licence Number:</u>	<u>Date of Issue:</u> <i>(yyyy/mm/dd)</i>	
<p>I certify that:</p> <ol style="list-style-type: none"> 1. The attached Report was prepared by a Professional Engineer who met the qualification requirements as stipulated in the "Terms of Reference for Assessment of Water System Infrastructure And Water Supply Sources - For Public Water Systems", and who is not an employee of the Water System Owner. 2. I have read the Report, and it is consistent with my understanding of the Water System. 3. I understand the Report to the best of my ability. 4. The information provided to the engineer, for the basis of this report, was accurate and complete to the best of my ability and knowledge. <p>The undersigned is the person, or the person designated by the Owner as being, responsible for the Water System:</p> <p>Signature of Owner: _____</p> <p>Name of Owner: _____</p> <p>Title: _____</p> <p>Date Signed: _____</p>		

TO BE COMPLETED BY THE ENGINEER:	Date of Report: (yyyy/mm/dd)
Name of Water System:	Community Code:

I certify that:

1. I prepared this System Assessment Report for this Water System.
2. I am a Professional Engineer registered in the Province of Manitoba with good standing.
3. I have relevant experience in sanitary engineering relating to drinking water supplies.
4. I have visited the Water System for the preparation of this Report.
5. This Report was prepared in accordance with the "Terms of Reference for Assessment of Water System Infrastructure And Water Supply Sources - For Public Water Systems".

DECLARATION OF ENGINEER SIGNING AND SEALING REPORT

"I, the undersigned, hereby declare that to the best of my knowledge, the information contained herein and the information in support of this submission is complete and accurate in accordance with my obligations under the *Engineering and Geoscientific Professions Act* and its regulations.

I further declare that this submission has been prepared in reasonable accordance with the published Terms of Reference for this submission, despite any qualifications in the agreement contracting me, and I acknowledge that the Office of Drinking Water and the Owner will be relying on the accuracy of this report."

Name of Engineer: _____

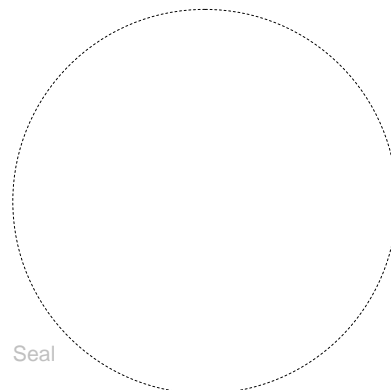
Signature of Engineer: _____

Date Signed: _____

Professional Engineer's seal and Certificate of Authorization to be affixed in the space below and signed by the Professional Engineer who prepared this Report.



Certificate of Authorization



Seal

TO BE COMPLETED BY THE ENGINEER:	Date of Report: (yyyy/mm/dd)
Name of Water System:	Community Code:
<p>Name of Engineer: _____</p> <p>Name of Company: _____</p> <p>Full Address: _____</p> <p>_____</p> <p>_____</p> <p>Telephone: _____</p> <p>Fax: _____</p> <p>Email: _____</p>	
<p>Checklist for submission to the Owner:</p> <p><input type="checkbox"/> Five (5) bound copies of the Report to the Owner.</p> <p><input type="checkbox"/> One (1) copy of complete Report on compact disk in PDF format to the Owner.</p> <p><input type="checkbox"/> Forms ODW-AF-01A and ODW-AF-01B signed and sealed and included in Report.</p>	
<p><i>This completed form is to be included with the Report submission to the Owner in both hard copy format and PDF version.</i></p>	