DRINKING WATER TREATMENT TECHNOLOGIES ASSESSMENT PROCEDURE

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Québec

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DRINKING WATER TREATMENT TECHNOLOGIES ASSESSMENT PROCEDURE

1. CONTEXT

In Québec, any project to build or modify drinking water treatment facilities serving more than 20 people must receive authorization from the Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP) under section 32 of the *Environment Quality Act* before construction begins.

To guide the various stakeholders during the authorization process for drinking water treatment systems, the MDDEP has made the following documents available on its website:

- *Contenu des demandes d'autorisation pour les projets d'installations de production d'eau potable* [Content of applications for authorization for drinking water production facility projects]
- *Procédure de mise aux normes des installations de production et des systèmes de distribution d'eau potable* [Standards setting procedure for bringing drinking water production facilities and distribution systems up to standard];
- *Guide de conception des installations de production d'eau potable* (Design Guidelines for Drinking Water Production Facilities).

The *Design Guidelines* describes and details the design criteria for water treatment technologies deemed able to meet the requirements of the *Regulation respecting the quality of drinking water* (RQDW).

In the event the technology or its implementation is deemed new, a Committee has been established to assess and determine if its level of development complies with the RQDW.

The Comité sur les technologies de traitement en eau potable [drinking water treatment technologies committee], hereinafter referred to as the "Committee", drafts technical assessment sheets for new treatment technologies that are not covered by the design guide, and publishes them on the MDDEP website.

The present document describes the procedure used to analyze drinking water treatment technologies in order to assess their level of development and allow the MDDEP to publish a technical assessment sheet.

2. THE COMMITTEE

The Committee is comprised of at least two engineers from the MDDEP, at least two engineers from the Ministère des Affaires municipales, des Régions et de l'Occupation du territoire (MAMROT), a coordinator, and experts from the university field.

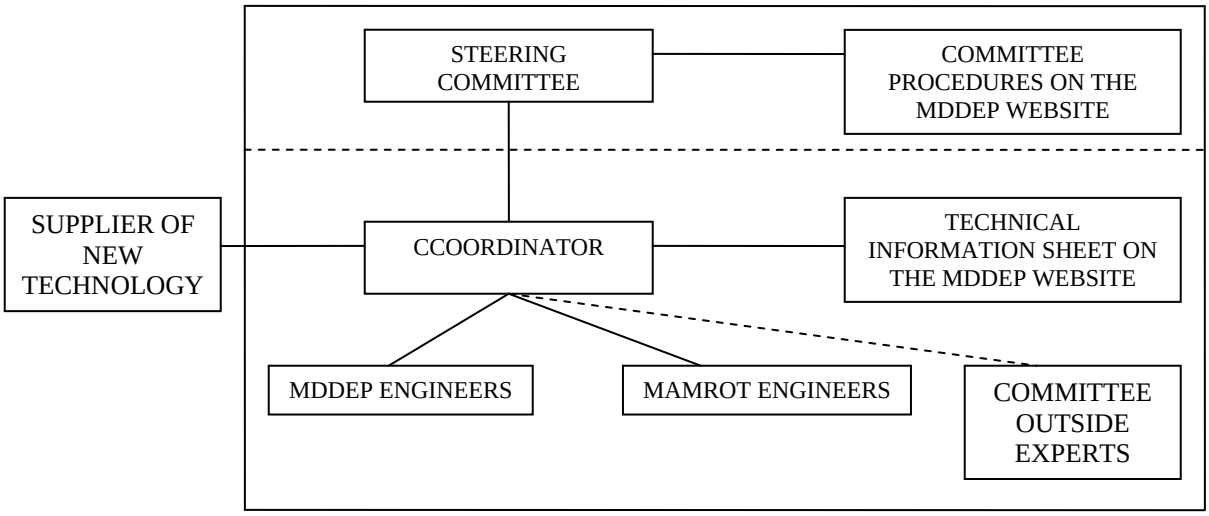
The coordinator is the Committee's official representative in dealing with suppliers. The outside experts on the Committee perform a mainly advisory role.

The members of the Committee are as follows:

Pierre Richer, Eng.	MAMROT (Committee coordinator)
Benoît Bernier, Eng.	MAMROT
Donald Ellis, Eng., M. Sc.	MDDEP
Eric Marcil, Eng., M. Sc.	MAMROT
Patrice Murray, Eng.	MDDEP
Simon Picard, Eng.	MDDEP
Benoît Barbeau, Eng., Ph. D.	École polytechnique de Montréal

The Committee is governed by a steering committee comprised of the head of the Service des eaux municipales [municipal water division] at the MDDEP and the director of the Direction des infrastructures – Montréal [infrastructure programs division for Montreal] at the MAMROT.

The following diagram outlines the relations between the stakeholders:



The Committee meets at the intervals determined by the coordinator.

The Committee may form sub-committees to analyze, in detail, the applications for technical assessment submitted by the promoters of new technology, or in response to a specific request from the steering committee. The sub-committees, after completing their analysis, make recommendations to the Committee. All decisions are based on a consensus reached by the members present at the meeting of the Committee. At least 60% of the

members, including at least one engineer from each of the two departments concerned, must be present at a meeting where a decision is made.

3. COMMITTEE MANDATE

A Committee has been convened to assess drinking water treatment technologies and to determine their level of development. It has been charged with the following responsibilities:

a) to gather information from technology promoters;

b) to examine the technologies on the basis of established criteria;

c) to determine the level of development of a technology and its conditions of implementation in terms of their ability to meet the requirements of the *Regulation respecting the quality of drinking water*;

d) to produce a technical assessment sheet for publication on the MDDEP website.

The Committee assesses the technology on the basis of the documents presented.

Where the information presented by the promoter meets the assessment criteria defined in this document, the Committee prepares a technical assessment sheet and, with the agreement of the promoter, publishes it on the MDDEP website.

The technical assessment sheets published by the MDDEP do not constitute certification or any other form of accreditation.

Neither the Committee, nor the two government departments concerned, may be held responsible for the adverse performance of a water treatment system designed on the basis of the information contained in the technical assessment sheet.

The promoter of the technology remains responsible for the information provided, and the evaluations carried out by the Committee do not relieve the promoter or the technology or the design engineer of their obligations, guarantees and responsibilities with regard to the implementation of the technology.

4. PRESENTATION OF AN APPLICATION TO THE COMMITTEE

Promoters are responsible for submitting an application for the analysis of their technology to the Committee coordinator, along with a complete technical file. This procedure must be followed for the assessment of new technologies and also for the modification of an existing technical assessment sheet.

The application will not be examined unless the documents submitted meet the requirements set out in this assessment procedure, with particular reference to section 6 and annexes 1, 2 and 3. Applications that do not meet the requirements will be rejected.

5. STANDARDS

To be considered by the Committee, the technology must meet the following criteria:

- the technology must comply with RQDW standards or, where target parameters are not standardized, the Guidelines for Canadian Drinking Water Quality;
- any materials required by the technology that come into contact with water must be certified NSF 61 or must comply with the appropriate standards of the Bureau de normalisation du Québec;
- any chemicals used in the processes must be certified NSF 60 or approved by Health Canada.

6. ASSESSMENT PROCEDURE AND DEVELOPMENT LEVELS

Each technology submitted is assessed on the basis of the following elements:

- the technical documents provided by the promoter according to the technological development level;
- the complexity of the technology with regard to equipment design and operation;
- performance results based on pilot tests and existing facilities as well as the related implementation conditions.

Each technology submitted is subject to an assessment procedure that consists of four separate phases or levels of development, described in the following paragraphs.

It is important to note that the Committee will not begin to assess a technology until the two first developmental levels, namely the experimental level and pilot-scale demonstration level, have been completed by the promoter and until a complete technical file is submitted in support of the application.

6.1 Technology at the experimental level

No technical assessment sheet is published by the Committee for this developmental level.

An experimental technology must have undergone laboratory testing or prototype testing to further its development and to generate short-term performance data.

Laboratory or prototype testing is under the responsibility of the promoter. The analysis may be conducted by the promoter, but it is advisable to have it validated by an independent laboratory.

A technology that is currently undergoing laboratory or prototype testing cannot be used as a treatment system to produce drinking water for human consumption and therefore does not require authorization from the MDDEP under section 32 of the *Environment Quality Act* (EQA). **Any discharge must be channelled into an existing sewer or authorized treatment system.**

No intervention by the Committee is necessary at this level.

It is the responsibility of the promoter to judge, based on the experimental results, if the project can advance to the next level.

6.2 Technology at the pilot-scale demonstration level

No technical assessment sheet is published by the Committee for this developmental level.

A technology considered to be at the pilot-scale demonstration level must undergo pilot-scale testing to fine-tune its development and generate performance data over a period of at least three months under stable operating conditions.

The procedure for monitoring pilot tests is described in annex 2-A, while the elements involved in recognition of removal credits and integrity monitoring are described in annex 2-B.

Analyses must be conducted by an independent laboratory accredited by the Centre d'expertise en analyse environnementale du Québec (CEAEQ).

A technology at the pilot-scale demonstration level cannot be used as a treatment system to produce drinking water for human consumption and therefore does not require authorization from the MDDEP under section 32 of the EQA. **Any discharge must be channelled into an existing sewer or authorized treatment system.**

The documents that must be submitted to the Committee in support of an application for classification at the following developmental level are described below at point 6.3.

6.3 Technology at the full-scale validation level

For technology to be considered at the full-scale validation level for a given range of source water conditions (flow rate, variable flow rates, type of raw water, etc.), the promoter must submit a formal application and obtain a technical assessment sheet from the Committee for this level.

When submitting a formal application, the promote must include one of the following documents:

- An engineering report compliant with annex 1, along with a report drawn up by an independent organization with monitoring results from pilot tests over a period of at least three months, in accordance with annex 2-A, showing that the technology reaches the anticipated performance levels and complies with RQDW standards. The engineering report may also detail, in accordance with annex 2-B, the removal credits established and the integrity monitoring method, if their recognition is requested.
- An engineering report demonstrating that the technology has already been successfully implemented outside Québec, ***under operating conditions equivalent to the target conditions***. The report must disclose monitoring data over a period of at least three months for one or more facilities operating in those equivalent conditions. The data must have been recorded by an organization that is independent of the promoter of the technology, and

The maximum number of full-scale facilities that may be authorized by the MDDEP on the basis of one technical assessment sheet at the **full-scale validation level** is five per technology.

Every technology at the **full-scale validation level** must be validated over a period of at least twelve months, as described in annex 3, before the promoter can move on to the following level.

When this requires the construction or modification of a full-scale water treatment plant to supply the drinking water distribution system, authorization must be obtained from the MDDEP under section 32 of the EQA.

All discharges must meet the specifications of Chapter 14 of the *Design Guidelines*.

The documents that must be submitted to the Committee in support of an application for classification at the next development level are described below at point 6.4.

6.4 Technology at the mature level

For a technology to be deemed **mature** for a range of source water conditions (flow rate, variable flow rates, type of raw water, etc.), the promoter must submit a formal application and obtain a technical assessment sheet from the Committee for this level.

When submitting a formal application, the promoter must include one of the following documents:

- An engineering report showing the monitoring results of the operation of a facility at the full-scale validation level compiled by an independent organization over a period of at least twelve months, in accordance with annex 3, demonstrating that the technology is able to generate the performance levels anticipated and that it complies with RQDW standards.
- An engineering report demonstrating that the technology has already been successfully implemented elsewhere, ***under operating conditions equivalent to the target conditions***. The report must disclose monitoring data over a period of at least twelve months for one or more facilities operating in those equivalent conditions. The data must have been recorded by an organization that is independent of the supplier of the technology, and must be sufficient to allow conclusions to be drawn concerning the target performances and their compliance with RQDW standards.

The maximum number of full-scale facilities that may be authorized by the MDDEP on the basis of one technical assessment sheet at the **mature level** is unlimited.

A technology considered to be at the **mature** level is dealt with in the same manner as a technology that is recognized by the *Design Guidelines.*

Treatability studies may be required, for example, to optimize the design of the treatment system. Treatability studies are determined by the technology supplier or the engineer.

Any discharge must comply with specifications in chapter 14 of the *Design Guidelines*.

7. DRAFTING AND PUBLICATION OF TECHNICAL ASSESSMENT SHEETS

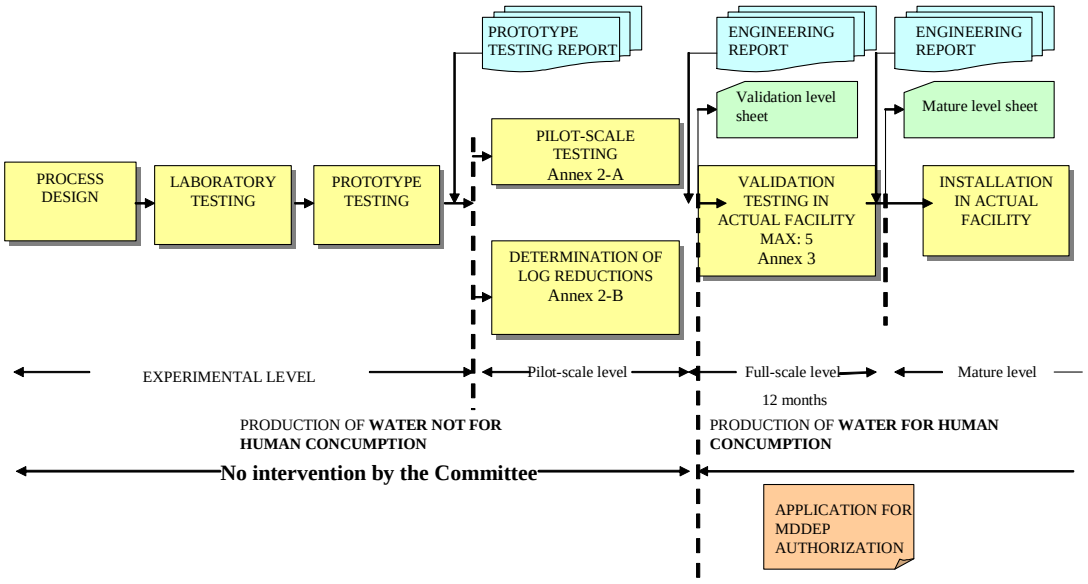
Within three months after the submission of a complete report that complies with this procedure, the Committee, after analyzing the documents submitted, sends the promoter either

- a proposal for a technical assessment sheet for the appropriate level (**full-scale validation** or **mature**, as the case may be); or
- a letter of rejection, summarizing the analysis of the information submitted by the promoter of the technology.

When a proposal for a technical assessment sheet is drafted, it is submitted to the promoter, who must complete it as required and notify the Committee, by return mail, that it agrees with the contents.

The Committee must then submit the draft technical evaluation sheet to a recognized firm for linguistic revision. The cost of the revision is charged to the promoter.

Following the linguistic revision, the technical assessment sheet, approved by the promoter, is published on the MDDEP website within two weeks.



FLOW-CHART SHOWING THE DEVELOPMENT OF A DRINKING WATER TREATMENT TECHNOLOGY

SUMMARIZED TABLE OF CHARACTERISTICS OF DRINKING WATER TREATMENT TECHNOLOGIES BASED ON LEVEL OF DEVELOPMENT

	LEVEL OF DEVELOPMENT			
	EXPERIMENTAL	**PILOT SCALE**	**FULL SCALE**	**MATURE**
Objective of the project utilizing the technology, by level of development	Verification of short-term performance at the laboratory scale Note: Cannot be used to produce drinking water for human consumption	Verification of the performance of a pilot-scale unit over a period of at least three months Note: Cannot be used to produce drinking water for human consumption	Production of drinking water for human consumption and Validation of the performance and operational reliability of an actual facility, over a period of at least one year	Production of drinking water for human consumption
Discharge of residual waters	Sewer or authorized treatment system	Sewer or authorized treatment system	Allowed, subject to specifications in chapter 14 of the *Design Guidelines*	Allowed, subject to specifications in chapter 14 of the *Design Guidelines*
Criteria for assessing the level of development	Experimental testing and monitoring carried out by the promoter, who determines what is necessary to advance beyond the experimental level No intervention by the Committee is generally needed	Protocol for pilot-scale demonstration testing and performance monitoring defined by the promoter in accordance with the guidelines in annex 2 of the Committee's procedure No intervention by the Committee is generally needed, but on request the Committee may make comments on the protocol drawn up by the promoter prior to testing	To be considered at the full-scale validation level, the technology must be supported by an engineering report (annex 1) based on the results of the pilot testing (annex 2-A) over a period of three months and, if requested, recognition of removal credits and integrity monitoring (annex 2-B) or an engineering report (annex 1) showing that the technology has been successfully implemented (over a minimum period of three months) elsewhere (1) and, if requested, recognition of removal credits and integrity monitoring (annex 2-B)	To be considered at the mature level, the technology must be supported by an engineering report (annex 1) based on validation monitoring over a period of twelve months in an actual facility (annex 3) or an engineering report (annex 1) showing that the technology has been successfully implemented (over a minimum period of three months) elsewhere (1)
MDDEP authorization for a project	Not required, but must comply with statutes and regulations in force	Not required, but must comply with statutes and regulations in force	Required	Required
Limit on the number of full-scale facilities	N/A	N/A	Five per technology	Unlimited
Alternative solution	N/A	N/A	Required if demands are not met	Not required

(1): If the technology has been tested elsewhere under equivalent operating conditions, pilot testing will not be required. Treatability testing may be required in order to confirm performance levels or optimize design parameters.

N/A: Not applicable

8. USE OF TECHNICAL ASSESSMENT SHEETS

The technical assessment sheets published on the MDDEP website are used, among other things, by analysts at the MDDEP regional offices to examine projects for drinking water production submitted for authorization under section 32 of the *Environment Quality Act*, and by analysts at the Direction générale des infrastructures [infrastructures division] at the Ministère des Affaires municipales et des Régions (MAMR) to examine projects for drinking water production submitted under a financial assistance program.

In many cases, the parameters recorded on a technical assessment sheet do not reflect the actual operating limits of the technology concerned, but instead what the promoter of the technology has been able to demonstrate formally.

The consulting engineers and analysts at the MDDEP regional offices and the analysts at the MAMR infrastructures division are required to refer to the technical assessment sheets, taking into account the limits referred to above and the particularities of each application.

In some cases, there may be grounds for accepting a project to implement technology that differs slightly from the data contained in the technical assessment sheet. The following principles will apply in such cases:

Cases in which the raw water parameters are exceeded

i) Critical parameters

If, during the preliminary engineering studies for a project, the target operating conditions exceed the values given for the critical raw water parameters in the technical assessment sheet:

- the consulting engineer in charge of the project must assess the conditions on which the technology may be implemented as part of the project. The engineer can consider applying the technology even if some of the values in the technical assessment sheet are exceeded, provided that the engineer submits, before the application for authorization to the MDDEP regional office, an application for a prior opinion along with a properly documented design file supporting the implementation of the technology;

- if the technical justification presented by the consulting engineer is considered by the MDDEP regional office to be insufficient to support a change from the parameters given in the technical assessment sheet, the promoter of the technology must submit to the Committee all the documents required, including the results of pilot-scale testing over a period of at least two weeks, to obtain a modification to the technical assessment sheet.

ii) Other parameters

If the conditions of implementation of the technology exceed the values given for certain other raw water parameters on the technical assessment sheet,

- the consulting engineer in charge of the project must assess the conditions on which the technology may be implemented as part of the project. The engineer can consider applying the technology even if some of the values in the technical assessment sheet are exceeded, provided that the engineer submits, before the application for authorization to the MDDEP regional office, an application for a prior opinion along with a properly documented design file supporting the implementation of the technology;

- if the values given for certain other raw water parameters are exceeded, the promoter is not, in principle, required to obtain a modification to the technical assessment sheet before the project is authorized. However, in some borderline cases, the consulting engineer or the MDDEP regional office may, if they consider it appropriate, ask the promoter to conduct pilot-scale testing to provide more support for the implementation of the technology. The promoter may also, if appropriate, use the results of the testing over a minimum period of two weeks to apply to the Committee for a modification to the technical assessment sheet.

Cases in which the design criteria exceed the values given in the technical assessment sheet, or in which the treatment sequence is modified

In these cases,

- the consulting engineer in charge of the project must assess the conditions on which the technology may be implemented as part of the project. The engineer can consider applying the technology even if some differences exist compared to the parameters given in the technical assessment sheet, provided that the engineer submits, before the application for authorization to the MDDEP regional office, an application for a prior opinion along with a properly documented design file supporting the implementation of the technology;

- if the technical justification presented by the consulting engineer is considered by the MDDEP regional office to be insufficient to support a change from the parameters given in the technical assessment sheet, the promoter of the technology must submit to the Committee all the documents required, including the results of pilot-scale testing over a period of at least twelve weeks, to obtain a modification to the technical assessment sheet. Since this involves modifications to the technology described in an existing technical assessment sheet, the promoter may propose pilot-scale testing to the Committee over a reduced period, if the implementation can be supported by results from other pilot-scale testing or from existing facilities operating in equivalent conditions.

9. MONITORING OF TECHNOLOGIES

Should the performance levels of one or more facilities authorized on the basis of a technical assessment sheet at the full-scale validation or mature level fail to meet expectations, after the results have been examined, the technical assessment sheet may be temporarily removed from the MDDEP website and the MDDEP will issue no further authorization for that technology unless the necessary corrections have been made.

If a technology is modified by the promoter subsequent to a failure to meet anticipated performance levels, the promoter must submit a new application to the Committee for the assessment of the modified technology. The new application must be supported by data covering at least six months of continuous operation with the modified technology.

The MDDEP, where is considers it appropriate, may require the implementation of a temporary alternative solution to ensure that the treatment performance levels meet the requirements of the RQDW. This temporary solution must be implemented to all existing facilities where a problem is occurring in compliance with RQDW.

A permanent solution must then be proposed by the promoter and validated by the Committee before other projects are authorized by the MDDEP.

10. CONFIDENTIALITY AND PROTECTION OF INFORMATION

All technology-related confidential information submitted by promoters to the Committee is used by the Committee solely and strictly for the purposes of its duties as described in this document.

All persons must, before taking part in the work of the Committee or a sub-committee formed by the Committee, sign a confidentiality and non-disclosure statement. The wording of the statement is given for information purposes in annex 4.

The expert or experts from outside the Government must withdraw from any discussion involving a technology with respect to which could be in a conflict of interest, or after a supplier has requested their withdrawal and presented suitable justification.

To avoid all conflict of interest, the Committee’s outside experts must withdraw from the examination of a file if they have helped develop or test the technology concerned, or if their withdrawal is explicitly requested by the promoter.

ANNEX 1

ENGINEERING REPORT

ANNEX 1

ENGINEERING REPORT

PREAMBLE

To facilitate the examination of their file, promoters must ensure that their application is complete and fully documented. They must also ensure that all the requirements have been met, especially concerning the contents of the engineering report that must be submitted to the Comité sur les technologies de traitement en eau potable [drinking water treatment technologies committee], hereinafter referred to as the "Committee".

CONTENTS OF THE ENGINEERING REPORT

The engineering report must contain the following elements, presented under seven chapter headings:

CHAPTER 1 – DESCRIPTION OF THE TECHNOLOGY

- Indicate the name, brand and model number.
- Explain the operating principles of the technology.
- Describe the treatment sequence.
- Describe each component of the technology and indicate its function.

CHAPTER 2 – ANTICIPATED PERFORMANCE LEVELS

- Indicate the performance levels of the technology by specifying the concentrations of each control parameter in treated water.

CHAPTER 3 – LIMITS OF USE AND TYPE OF PRE-TREATMENT REQUIRED

- Specify the range of flow rates within which the technology or each model of the technology can be used.
- Specify the range of concentrations that apply to a critical parameter in order for the technology to operate correctly, within the application.
- Indicate any other limitations to the use of this technology, such as excessive turbidity, large amounts of organic matter, etc.
- If the technology requires a pre-treatment phase, provide specifications regarding pre-treatment or specific references in the *Design Guide for Drinking Water Production Facilities (Design Guide)* or a section of the related technical manual.

CHAPTER 4 -- BY-PRODUCTS AND TREATED WASTEWATER EFFLUENT

- Provide a list of by-products that may form during treatment and possible concentrations. Specify, where necessary, the relationships between the quality of the raw water, products metering and the resulting concentration of by-products.
- Indicate the types of wastewater (sludge, sour water and other process water) produced during treatment and provide an estimate of anticipated amounts.

CHAPTER 5 – TECHNICAL SPECIFICATIONS AND DESIGN CRITERIA

- Provide technical specifications for each component that may have an impact on the performance of the technology.

- Specify the proposed design criteria, duplicated equipment, emergency response measures, monitoring, alarms, etc.
- If the dimensioning of the treatment units is based on a kinetic model or another mathematical model, provide this model and the coefficient values used.
- Include any curves or charts of the manufacturer on which the dimensioning of the treatment units is based.

CHAPTER 6 – JUSTIFICATION IN SUPPORT OF AN APPLICATION FOR CLASSIFICATION

6.1 Technology at the experimental and pilot-scale demonstration levels

No technical assessment sheet is published by the Committee to formally recognize these levels of development.

It is the responsibility of the promoter to judge, based on the experimental results, if the project can advance to the next level.

However, the promoter must present for information purposes, at the beginning of this chapter of the report, an assessment of the experimental testing conducted prior to the pilot-scale demonstration level.

Where the proposed technology is based on proven technology to which the promoter wishes to add new elements, the following information must be presented at the beginning of the chapter:

- the name of the proven technology used as a benchmark;
- the design criteria for the proven technology, with the relevant bibliographical references (*Design Guidelines* or other documents);
- a comparison between the design criteria for the proposed technology and the design criteria for the proven technology;
- an assessment of the potential impact the differences between the two technologies may have on system operation or performance;
- a comparative analysis of the pre-treatment recommended for the proposed technology and the pre-treatment generally required for the proven technology.

6.2 Justifications required for classification at the full-scale validation level

The technology must have undergone pilot testing (or other testing, as specified in annex 2) or must have been implemented successfully in equivalent operating conditions. The technology must comply with the standards of the *Regulation respecting the quality of drinking water*.

6.2.1 Justifications based on the results from the monitoring of a pilot unit over a period of at least three months

The monitoring procedure must comply with annex 2. The engineering report must include the following information:

- the names of firms that have conducted sampling, analyses and interpretation of monitoring data;
- the address, characteristics and technical specifications of facilities that have been monitored;
- the differences between the facilities monitored and the technology or model proposed;
- the capacity of the mechanical equipment;
- a comparison between actual operating conditions and applicable design criteria (rate of filtration, upward flow rate, retention time, etc.);

- the testing conditions (weather conditions, raw water temperature or other factors that may affect the performance of the technology);
- the activities carried out prior to and during testing;
- all of the results available on raw water and treated water quality;
- a comparison between final results and anticipated performance levels (verification if they are consistent with the mathematical model or manufacturer's curves, where applicable);
- any other relevant information for the interpretation of the results.

6.2.2 Justifications based on a technology that has been in operation elsewhere for at least three months

The engineering report must show that the technology has been implemented successfully for at least three months in equivalent operating conditions. The engineering report must include the following information:

- the locations where the technology is in use;
- proof that this technology is currently in use elsewhere and not in a validation phase;
- the length of time over which the technology has been used elsewhere and the number of systems put into commission in the provinces and countries in question;
- the characteristics and technical specifications of the technology, as it is used elsewhere, and proof that the characteristics and technical specifications are the same as those proposed for the implementation of the technology in Québec;
- the weather conditions of the location(s) in which the technology is in use and proof that the conditions are representative of the operating conditions that will apply to this technology in Québec;
- an assessment of the performance levels of the technology in at least one facility over a minimum period of twelve consecutive months, including source water and design data that apply to drinking water;
- any information relevant to the operation of the technology at the location where it is currently in use (skills of labour force, operating agreement signed with a specialized firm, schedule of activities, etc.).

N.B. This must be the same technology and not a comparable technology. It must also be implemented using the same configurations and characteristics and the same design criteria as those that will be implemented in Québec.

6.3 <u>Justifications required for classification at the mature level</u>

The engineering report must demonstrate that the proposed technology has achieved a level of performance reliability and mechanical and operational reliability that allow it to be considered mature. This demonstration must be based on the validation monitoring of a full-scale project over a period of at least twelve consecutive months.

6.3.1 Justifications based on the validation monitoring of a facility in Québec over a period of twelve months

The validation monitoring must be conducted on the basis of a protocol drawn up by the promoter in accordance with annex 3.

The validation monitoring must confirm that the technology will achieve the expected level of performance and comply with the standards of the *Regulation respecting the quality of drinking water*. In addition to the information prescribed in sections 6.2.1 or 6.2.2, the engineering report submitted must include the following information:

- a description of each activity carried out at the facilities monitored, and an analysis of these activities as they pertain to the design, operation, inspection and maintenance of the technology (specifying if, for example, specialists have had to intervene, and if specialist intervention is provided for in the operating, inspection and maintenance guide provided by the manufacturer);
- if an activity that is not scheduled in the manufacturer's guide has been required, or has been required more often than expected, the guide must be revised accordingly.

6.3.2 Justifications based on a report on twelve-month operating data from an existing facility outside Québec

In place of the validation monitoring of a facility in Québec over a period of twelve months, as described at point 6.3.1, the promoter may submit to the Committee a detailed report containing operating data from an existing facility outside Québec over a period of at least twelve months.

The promoter must show that the choice of the facility outside Québec is relevant in terms of the conditions for the implementation of the technology in Québec.

The laboratory analyses presented in the report must be credible (the laboratory must be accredited by the province of state concerned or a plant laboratory recognized by the local authorities).

The data and operating results must have been compiled by or under the direct supervision of credible operators (operators with training accredited by the local authorities).

An engineer with recognized professional status in Québec, or in the province or state concerned, and with recognized experience in water treatment for drinking water production, must validate on-site the quality of the information relating to the 12-month period of operation. The engineer must present a signed report containing the operating data gathered and the engineer's interpretation concerning the targeted performance level and operational reliability of the process. The report must also include a confirmation from the relevant authorities that the facility produces water that complies with the regulations in force with respect to the parameters targeted by the technology involved.

CHAPTER 7 – GUIDE AND RECOMMENDATIONS REGARDING OPERATION

- Provide an operating manual that specifies the operating, inspection and maintenance activities recommended by the manufacturer.
- Specify the schedule of recommended activities if they are regular periodic activities or indicate the criterion that is the basis for an action (volume or height of sludge accumulated in a tank, accumulation of water on filter surface or other).

ENGINEER'S SIGNATURE

- Where the monitoring was conducted in Québec, the engineering report must be signed by an engineer who is a member of the Ordre des ingénieurs du Québec and who is independent of the promoter.
- Where a facility outside Québec was monitored, the engineer's report may be signed by an engineer with recognized professional status in the province or state concerned, and with recognized experience in water treatment for drinking water production.

ANNEX 2

MONITORING OF PILOT-SCALE TESTING

ANNEX 2-A

MONITORING OF PILOT-SCALE TESTING

1. PURPOSE OF MONITORING

The purpose of monitoring pilot-scale testing is to verify how a technology performs and to generate data that can be used to determine if the technology has, for a given implementation, achieved a level of development that makes a full-scale facility possible, with an acceptable degree of confidence concerning performance reliability.

Note: The monitoring of pilot-scale testing is not the same as a certification process, which requires standardized tests, closer monitoring, a quality-control mechanism applied by the manufacturer, and post-certification monitoring to maintain certification. In addition, validation monitoring does not lead to approval of the technology for marketing purposes.

2. PROTOCOL FOR THE MONITORING OF PILOT-SCALE TESTING

The type of monitoring may vary depending on the technology and water supply source (surface water or groundwater). Sampling must be conducted once the pilot unit has reached stable operating conditions.

The promoter must prepare a **protocol for the monitoring of pilot-scale testing** taking into account the guidelines contained in this annex, and adapt it to the technology and its implementation.

The protocol must be submitted to the Comité sur les technologies de traitement en eau potable [drinking water treatment technologies committee], hereinafter referred to as the "Committee", within a reasonable time before the start of testing.

3. DURATION OF THE MONITORING OF PILOT-SCALE TESTING

The pilot unit must be operated in benchmark conditions for a period of at least three consecutive months and, if the unit uses surface water, covering a period where the quality of the raw water is representative of the expected variation in actual conditions.

4. SUPERVISION BY A QUALIFIED FIRM

The monitoring of pilot-scale testing must be conducted under the supervision of a qualified firm, in other words a firm in which at least one engineer has the expertise necessary to monitor the technology.

The mandate of the firm must include the supervision of sampling, analysis (conducted by an accredited laboratory), the recording and tracking of all operating parameters, the presentation of compiled results, the interpretation of the results and the drafting of the monitoring report.

5. RESPONSIBILITY FOR THE OPERATION OF THE PILOT UNIT

The promoter is responsible for the operation of the pilot unit.

6. PARAMETERS AND NUMBER OF ANALYSES

Tables 1.1 and 1.2 specify the basic parameters for monitoring pilot-scale testing. Table 1.1 must be used for surface water and Table 1.2 for groundwater. Additional analyses of specific parameters may also be requested in response to a local situation (for example, the analysis of aluminum where alum is in use).

Special case: Monitoring of the parameters of a technology forming part of a complete treatment process

Where the technology analyzed may be part of a complete treatment process, the monitoring must also cover the operating parameters of the various processes involved and interim sampling.

7. MODIFICATIONS DURING TESTING

During pilot-scale testing, no major modification must be made to the facility. If a major modification is made, the monitoring of pilot-scale testing must be continued for at least three consecutive months after the modification is implemented.

8. CONTENT OF THE REPORT ON THE MONITORING OF PILOT-SCALE TESTING

The monitoring report must include the following elements:

- a presentation of all the compiled analytical results (the laboratory analysis certificates must be included in an annex) and an interpretation of the results;
- a description of the products added (coagulant, flocculent, oxidizing agent or other additives), the quantities involved, and how often these products were added over the entire monitoring period;
- a description of all significant events that occurred (equipment malfunctions, repairs, adjustments, minor changes to the system, or other).

The report on the monitoring of pilot-scale testing is prepared by the engineer of the firm acting as a third party independently from the promoter. The engineer must sign the page describing the engineer's mandate in detail.

The monitoring report by the independent firm can be a separate document included with or presented as an annex to the engineering report by the promoter of the technology.

It is the responsibility of the promoter of the technology to prepare an engineering report (described in annex 1 of this procedure) and to make any required adjustments to the design criteria in light of the conditions observed during the pilot-scale testing.

Table 1.1: Parameters and number of analyses
Pilot-scale testing with surface water

BASIC PARAMETERS	**RAW WATER** Number of samples	**TREATED WATER** Number of samples
pH (on site)	**13**	**13**
Temperature (on site)	**13**	**13**
Faecal coliforms	**13**	**13**
Total coliforms	**optional**	**optional**
BHAA	**optional**	**optional**
BSA	**13**	**13**
True colour (on site)	**13**	**13**
Total organic carbon (TOC, see note 1)	**13**	**if required**
Dissolved organic carbon (see note 1)	**13**	**6**
Turbidity	**13**	**13**
UV absorbance at 254 nm (see note 1)	**13**	**6**
Ammoniacal nitrogen	**3**	**if required**
Nitrites	**3**	**if required**
Nitrates and nitrites	**3**	**if required**
Chlorine demand (see note 2)	**optional**	**6**
Total alkalinity	**6**	**6**
Al (for technologies using aluminium salt)	**6**	**6**
Calcium	**6**	**6**
Hardness	**6**	**6**
Iron	**6**	**6**
Manganese	**6**	**6**
Silt Density Index (SDI, see note 3)	**6**	**-**
Dissolved solids	**3**	**3**
Total solids	**3**	**3**
Conductivity	**optional**	**optional**
SDS-THM (see note 2)	**N/A**	**3**
SDS-AHA (see note 2)	**N/A**	**3**

Note 1: these analyses are useful to evaluate the specific UV absorbance value (SUVA) of the raw water.

Note 2: 24-hour test with 0.5 ± 0.2 mg/L of free available residual chlorine after 24 h, pH of 7.5 and ambient temperature of ± 22ºC.

Note 3: these analyses are mandatory only for technologies using nanofiltration. Sampling is to be done prior to the first membrane stage but after the recirculation loop if there is one.

Table 1.2: Parameters and number of analyses
Pilot-scale testing with groundwater

BASIC PARAMETERS	**RAW WATER** Number of samples	**TREATED WATER** Number of samples
pH (on site)	**13**	**13**
Temperature (on site)	**13**	**13**
Faecal coliforms	**13**	**13**
Total coliforms	**13**	**13**
BHAA	**optional**	**optional**
True colour (on site)	**13**	**13**
Total organic carbon (TOC)	**13**	**13**
Turbidity	**13**	**13**
Dissolved oxygen (on site)	**6**	**6**
Nitrites	**3**	**if required**
Nitrates and nitrites	**3**	**if required**
Chlorine demand (see note 1)	**N/A**	**6**
Total alkalinity	**6**	**6**
Hardness	**6**	**6**
Al (for technologies using aluminium salt)	**6**	**6**
Arsenic	**3**	**3**
Barium	**3**	**3**
Calcium	**6**	**6**
Iron	**6**	**6**
Manganese	**6**	**6**
Silt Density Index (SDI, see note 2)	**6**	-
Chlorides	**3**	**3**
Fluorides	**3**	**3**
Sulfates	**3**	**3**
Sulfides	**3**	**3**
Sodium	**3**	**3**
Dissolved solids	**3**	**6**
Total solids	**3**	**3**
Conductivity	**optional**	**optional**
Redox potential	**3**	**3**
SDS-THM (see note 1)	**N/A**	**6**
SDS-AHA (see note 1)	**N/A**	**6**

Note 1: 24-hour test with 0.5 ± 0.2 mg/L of free available residual chlorine after 24 h, pH of 7.5 and ambient temperature of ± 22ºC.

Note 2: these analyses are mandatory only for technologies using nanofiltration. Sampling is to be done prior to the first membrane stage but after the recirculation loop if there is one.

ANNEX 2-B
DETERMINATION OF LOG REDUCTIONS

Annex 2-B details the methodologies accepted by the Committee to determine log reductions.

Two cases are presented, namely UV and other treatment systems.

CASE 1 - UV REACTORS

The performance of any disinfection reactor using UV radiation to treat water for human consumption must have been validated using a bioassay method recognized by the Committee. The purpose of validation is to confirm the effective dose delivered by the UV reactor under different operating conditions and to ensure that sensors are calibrated on the basis of the effective dose delivered.

Given the large number of standards in existence, the manufacturer must submit along with its test results, the validation procedure used and the name of the independent agency that supervised bioassay tests. The following validation protocols are currently benchmarks in this field: German (DVGM-W294), Austrian (ONORM M 5873-1) or American (NWRI- AWWARF and NSF-55). The EPA's validation procedure (UVGM), in the 2003 version, the revised version from 2003 to 2006, or the new version of November 2006, may also be used to validate the performance of a UV reactor.

If bioassays are conducted at the sites where reactors are to be installed, the protocol used must comply with one of the protocols recognized by the Committee and must be approved by the Committee before testing begins.

CASE 2 – OTHER TREATMENT SYSTEMS

The maximum credit awarded for treatment systems is the lowest value of the following:

- the lowest removal (in log) obtained during testing to determine removal credits;
- maximum removal (in log) verified through periodic measurement of system integrity.

Protocol for determining parasite and virus removal credits

There is currently only one recognized protocol by which removal credits[1] for treatment systems are awarded. This protocol is based on use of reference particles or microorganisms to verify the quality of a system's manufacturing and assembly with respect to removal of parasites and viruses. In accordance with this protocol, the Committee has issued the following guidelines:

- the **reference particles** used (inert particulates, microorganisms or other) are **representative** of targeted organisms (parasites or viruses) and are easily **measurable or countable** (for example by using spore-forming aerobic bacteria, MS2 bacteriophagic viruses, fluorescent calibrated particles, etc.);
- a sufficient number of **reference particles** are used in order to determine the level of removal from the tested system;
- the **tested system** is **representative of the full-scale system,** for example by using the same types of membrane, operating conditions (membrane flux, quality of water in front of membranes, flow conditions), assembly methods and equipment, casing, etc.;

Another approach may be recognized to determine removal credits, on the condition that it clearly shows disinfection levels equivalent to those prescribed.

It is therefore the responsibility of each supplier to establish a protocol and to submit it for Committee approval. This protocol **must be accompanied** with the protocol for recognition of a method for monitoring the integrity of the treatment system submitted (see following section).

Protocol for recognizing a method of monitoring integrity

The aim of this protocol is to ensure that by monitoring (on-line or periodic) its integrity, the process under study continues to maintain credits for removal of parasites and viruses using a recognized method (direct or indirect measurement). Although there are a number of methods on the market for measuring the integrity of processes, there is currently no protocol that can link an integrity monitoring method to the removal credits awarded. The Committee has therefore issued guidelines for recognition of an integrity monitoring method that can be linked to the removal credits awarded:

- **direct methods of measuring** integrity are **preferred** over indirect methods (the following table details some methods and their advantages and disadvantages);

[1] Protocol EPA/NSF ETV: "Protocol for equipment verification testing for physical removal of microbiological and particulate contaminants", 1999.

METHODS OF MONITORING INTEGRITY		
INDIRECT METHODS	**ADVANTAGES**	**DISADVANTAGES**
Measurement of turbidity of permeate	-Easy to use -Inexpensive	- Not as precise as the two methods below
Monitoring of particles in the permeate	-More accurate than the measurement of turbidity	- More expensive than the measurement of turbidity
The count of particles in the permeate	-Very accurate	- More expensive than the two above methods - More complicated than the measurement of turbidity
DIRECT METHODS	**ADVANTAGES**	**DISADVANTAGES**
Pressure decay test [1]	-Easy to perform -Easy to automate	-Mandatory shutdown of filtration -Must be added to the process
Vacuum decay test[2,3]		
Measurement of bubble point[1]	-Easy to perform -Measurement of sizes of defects in membranes	-Mandatory shutdown of filtration -Measurement by hand, module by module -Difficult to implement on a large scale plant
Acoustic detection[1]	-In-line monitoring	-Background noise must be controlled

[1] Used for hollow-fibre membrane modules
[2] Used primarily for spiral-wound modules
[3] Existing standard: ASTM D3923-94 (1998), "Standard practices for detecting leaks in reverse osmosis devices"

- the **method used** for the system under study must be **validated at the same time** as **removal credits** for parasites and viruses are determined;

- the **method used** must be **sensitive** enough to detect a **variation in the quality of the water treated**, which would affect the accuracy of the number of removal credits obtained by the system under study (for example, if 5 logs of removal are awarded to the system under study, the integrity monitoring method must be able to make a distinction between 5 logs and 4 logs of removal).

It is therefore the responsibility of each supplier to establish a protocol and to submit it for Committee approval. This protocol **must be accompanied** with the protocol for determining parasite and virus removal credits (see above section).

ANNEX 3

MONITORING OF TECHNOLOGIES AT THE FULL-SCALE VALIDATION LEVEL

ANNEX 3-A
VALIDATION MONITORING

PURPOSE OF VALIDATION MONITORING

The purpose of validation monitoring is to verify the full-scale performance level of the technology and to generate data that can be used to determine if the technology can be deemed mature for a particular implementation in terms of both performance and operational reliability.

Note: Validation monitoring is not the same as a certification process, which requires standardized tests, closer monitoring, a quality-control mechanism applied by the manufacturer, and post-certification monitoring to maintain certification. In addition, validation monitoring does not lead to approval of the technology for marketing purposes.

2. PROTOCOL FOR THE MONITORING OF VALIDATION TESTING

The type of monitoring may vary depending on the technology and water supply source (surface water or groundwater). Sampling must be conducted when the facility is operating normally.

The promoter must prepare a **protocol for validation monitoring** taking into account the guidelines contained in this annex 3A, as well as the guidelines in annex 3B describing **secondary monitoring** proposed by the Committee in various cases.

The monitoring protocol must be adapted to the technology and its implementation.

The protocol must be submitted to the Comité sur les technologies de traitement en eau potable [drinking water treatment technologies committee], hereinafter referred to as the "Committee", within a reasonable time before the start of monitoring.

The Committee will make comments on the protocol and, if it considers that the monitoring proposed by the promoter is incomplete, propose secondary monitoring targeting certain periods of the year or certain specific parameters to ascertain how the technology responds in the actual conditions of the full-scale facility concerned.

3. DURATION OF THE VALIDATION MONITORING

The validation monitoring lasts a minimum of twelve consecutive months.

4. SUPERVISION BY A QUALIFIED FIRM

The validation monitoring must be conducted under the supervision of a qualified, independent firm (called the "third party"), in other words a firm in which at least one engineer has the expertise necessary to monitor the technology.

The mandate of the firm must include the supervision of sampling, analysis (conducted by an accredited laboratory), the recording and tracking of all operating parameters, the presentation of compiled results, the interpretation of the results and the drafting of the monitoring report.

5. RESPONSIBILITY FOR OPERATIONS DURING THE VALIDATION MONITORING

During the validation monitoring, operations must in general be under the responsibility of the owner of the facility.

The promoter of the technology cannot be in charge of operations.

6. PARAMETERS AND NUMBER OF ANALYSES

Tables 2.1 and 2.2 specify the basic parameters for a validation monitoring. Table 2.1 must be used for surface water and Table 2.2 for groundwater. Additional analyses of specific parameters may also be required in response to a local situation. **A validation project must also be submitted to a mandatory inspection of the quality of drinking water, in accordance with regulations in force.**

If the validation monitoring is conducted in a facility in Québec, the monitoring covers one year, considering four periods of activity calling on the maximum design criteria (peak conditions) for water production:

- one week in winter;
- one week in spring (targeting the worst conditions for raw water);
- one week in summer;
- one week in fall (targeting the worst conditions for raw water).

It should be noted that for practical reasons of staff management, a week is considered to be five consecutive days from Monday to Friday.

Sampling shall be conducted as follows:

- during each of the four weeks of maximum criteria, five samples will be taken (making twenty in all), and the samples will count for the month concerned;
- during each of the remaining months, one sample will be taken (making eight in all).

Monitoring of the parameters of a technology forming part of a complete treatment process

Where the technology analyzed forms an integral part of a complete treatment process, the monitoring must also cover the operating parameters of the various processes involved and interim sampling, the contents of which must be approved by the Committee.

Monitoring the integrity of membrane filtration processes

If a membrane filtration technology has received removal credits, the integrity of the membrane systems must be monitored, subject to approval by the Committee.

7. MODIFICATIONS DURING OPERATIONS

During validation monitoring, no major modification must be made to the facility. If a major modification is made, the validation monitoring must be continued for at least one year after the modification is implemented.

8. CONTENT OF THE MONITORING REPORT

The monitoring report must contain the following elements:

- a presentation of all the compiled analytical results (the laboratory analysis certificates must be included in an annex) and an interpretation of the results;
- a description of the products added (coagulant, flocculent, oxidizing agent or other additives), the quantities involved, and how often these products were added over the entire monitoring period;
- a description of all significant events that occurred (equipment malfunctions, repairs, adjustments, minor changes to the system, or other).

The report on the validation monitoring is prepared by the engineer of the firm acting as a third party independently from the promoter. The engineer must sign the page describing the engineer's mandate in detail.

The monitoring report by the independent firm can be a separate document included with or presented as an annex to the engineering report by the promoter of the technology.

It is the responsibility of the promoter of the technology to prepare an engineering report (described in annex 1 of this procedure) and to make any required adjustments to the design criteria in light of the conditions observed during the validation monitoring.

9. DISCLOSURE OF RESULTS

The independent firm commissioned to supervise the validation monitoring must send its analysis results each month to the MDDEP regional office and inform it immediately when the parameters exceed the established standards.

The firm must submit its report on the validation monitoring to the promoter, the Committee and the MDDEP regional office no later than 15 months after the facility begins to operate.

Table 2.1: Parameters and number of analyses
Validation project with surface water

BASIC PARAMETERS	**RAW WATER**	**TREATED WATER**
	Number of samples	Number of samples
pH (on site)	**28 (8 months + 4 weeks x 5 samples)**	**28**
Temperature (on site)	**28**	**28**
Faecal coliforms	**28**	**28**
Total coliforms	**28**	**28**
BHAA	**28**	**28**
True colour (on site)	**28**	**28**
Total organic carbon (see note 1)	**28**	**28**
Turbidity	**28**	**28**
UV 254 nm absorbance (see note 1)	**28**	**28**
Ammoniacal nitrogen	**28**	**if required**
Nitrites	**12 (8 months + 4 weeks x 1 sample)**	**if required**
Nitrites and nitrates	**12**	**if required**
Chlorine demand (see note 2)	**N/A**	**12**
Total alkalinity	**12**	**12**
Al (for technologies using aluminium salt)	**12**	**12**
Calcium	**12**	**6 (2 months + 4 weeks x 1 sample)**
Hardness	**12**	**6**
Iron	**28**	**28**
Manganese	**28**	**28**
Silt Density Index (SDI, see note 3)	**6**	**-**
Dissolved solids	**12**	**12**
Total solids	**12**	**12**
Conductivity	**28**	**28**
SDS-THM (see note 2)	**N/A**	**12**
SDS-AHA (see note 2)	**N/A**	**12**

Note 1: these analyses are useful to evaluate the specific UV absorbance value (SUVA) of the raw water.
Note 2: 24-hour test with 0.5 ± 0.2 mg/L of free available residual chlorine after 24 h, pH of 7.5 and ambient temperature of ± 22ºC.
Note 3: these analyses are mandatory only for technologies using nanofiltration. Sampling is to be done prior to the first membrane stage but after the recirculation loop if there is one.

Table 2.2: Parameters and number of analyses
Validation project with groundwater

BASIC PARAMETERS	RAW WATER	TREATED WATER
	Number of samples	Number of samples
pH (on site)	**13**	**13**
Temperature (on site)	**13**	**13**
Faecal coliforms	**26**	**26**
Total coliforms	**26**	**26**
BHAA	**26**	**26**
True colour (on site)	**26**	**26**
Total organic carbon	**13**	**13**
Turbidity	**26**	**26**
Dissolved oxygen (on site)	**13**	**13**
Nitrites and nitrates	**13**	**13**
Chlorine demand (see note 1)	**N/A**	**13**
Total alkalinity	**13**	**13**
Al (for technologies using aluminium salt)	**13**	**13**
Arsenic	**13**	**13**
Barium	**13**	**13**
Calcium	**26**	**26**
Hardness	**26**	**26**
Iron	**26**	**26**
Manganese	**26**	**26**
Silt Density Index (SDI, see note 2)	**6**	-
Sulfates	**13**	**13**
Sodium	**13**	**13**
Chlorides	**13**	**13**
Sulfides	**13**	**13**
Fluorides	**13**	**13**
Dissolved solids	**13**	**13**
Total solids	**13**	**13**
Conductivity	**26**	**26**
Redox potential	**26**	**26**
SDS-THM (see note 1)	**N/A**	**13**
SDS-AHA (see note 1)	**N/A**	**13**

Note 1: 24-hour test with 0.5 ± 0.2 mg/L of free available residual chlorine after 24 h, pH of 7.5 and ambient temperature of ± 22ºC.

Note 2: these analyses are mandatory only for technologies using nanofiltration. Sampling is to be done prior to the first membrane stage but after the recirculation loop if there is one.

ANNEX 3-B
SECONDARY MONITORING

Annex 3-B details the secondary monitoring proposed by the Committee for different cases.

CASE 1

OPERATIONAL UV VALIDATION

The manufacturer must provide data on the monitoring of at least one existing UV system that has been in operation for a period of at least twelve consecutive months. Data must have been gathered by an independent agency. Existing facilities may be in Québec or elsewhere in the world, so long as the water temperature is similar to that in Québec.

Table 1 Monitoring parameters and analysis schedule for validation of UV systems

PARAMETERS	**SCHEDULE**
Operating conditions	
Flow rate	Monthly average
Operating dose for the reactor	Continuous
UV transmittance	Min-Avg-Max for one year
Turbidity	Min-Avg-Max for one year
Temperature	Monthly average
Total number of stops/starts	For one year of operation
Number of lamps, stub pipes, intensity sensors and ballasts replaced	For one year of operation
Average age of lamps	Monthly average
Cleaning frequency (if applicable)	Number per month
Total power consumption	Monthly average Monthly maximum
Explanatory monitoring of alarms	
List of low dose alarms	For one year of operation
List of grounding alarms	
List of operation shutdowns	

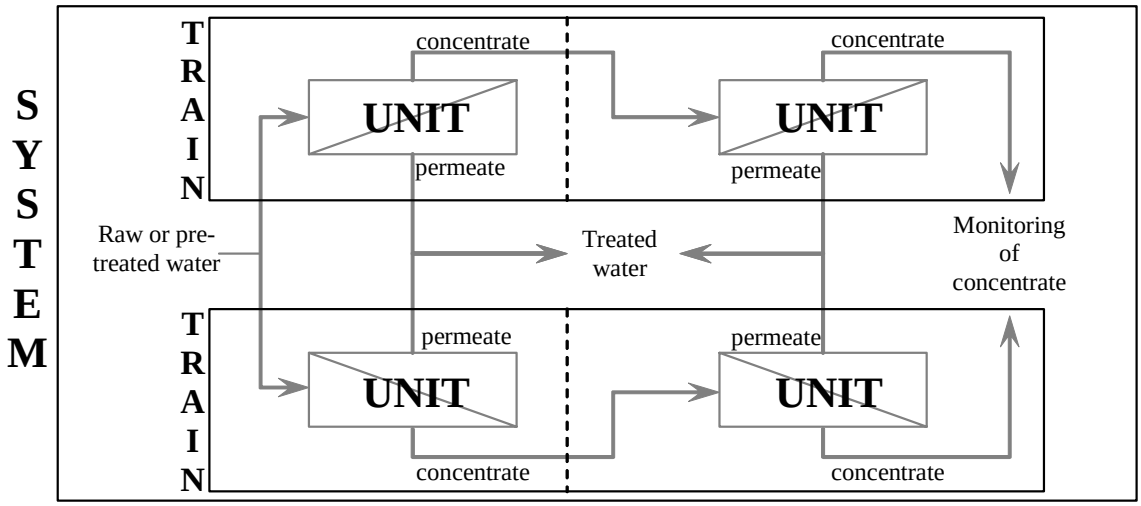
CASE 2

PROJECTS INVOLVING MEMBRANES

EQUIPMENT INSPECTION AND MONITORING

The terminology used here is the same as that used in the *Design Guidelines for Drinking Water Production Facilities* available on the MDDEP website. The principal terms used in connection with equipment inspection and monitoring are repeated here and illustrated in figure 1:

Figure 1: Diagram of a facility using membranes for treatment



Membrane: very thin layer of material used for separation on a microscopic scale.

Module: manner in which membranes are arrayed (spiral wound, tubular, hollow fibers, casing and frame, etc.). This is the basic element of a membrane treatment system.

Caisson: a usually pressurized housing containing one or more modules.

Unit: manner in which modules are placed. In a unit, the modules may be placed parallel, in a series or both simultaneously (for example, 10 parallel rows of 3 modules in a series).

Train: an independent membrane treatment assembly. Each train may contain a single unit or several units with related pumps.

System: a complete treatment assembly including pre-treatments, trains (one or several in parallel) as well as post-treatments.

EQUIPMENT AND MONITORING

To ensure a membrane filtration system operates efficiently, certain equipment is essential, such as isolation valves for each unit and pump (maintenance) or

interconnected piping between the units (any pump can supply any membrane train). Certain parts are also required for monitoring and inspecting module integrity.

The Committee has detailed a list of equipment necessary for a treatment facility that uses membranes, in order to monitor the process:

Types of equipment	**Parameters to monitor**	**Rate of monitoring**
Sample collection	Quality of raw water	See annex 2 or 3
	Quality of treated water	See annex 2 or 3
Temperature sensor	Temperature of treated water	Continuous
Pressure sensor	Pressure at pre-treatment intake	Continuous
	Differential pressure in pre-treatment	Continuous
	Pressure at intake of each unit	Continuous
	Pressure at outlet of each unit (permeate and concentrate)	Continuous
Flow meter	Flow rate of raw (or pre-treated) water at the intake of each train	Continuous
	Flow rate of permeate at the outlet of each unit	Continuous
	Flow rate of concentrate to the outlet of each unit	Continuous
Turbidity meter (accurate to the hundredth NTU)	Turbidity of the permeate of each train	Continuous
Measurement of integrity	Integrity of membranes	According to Committee approval

The Committee has also detailed a list of parameters to monitor for a more accurate inspection of the modules and to optimize treatment performances:

Type of equipment	**Parameters to monitor**
Sample collection	Permeate quality (each unit)[a]
	Concentrate quality (each unit)[a]
	Quality of sour water (each unit)[a]
Pressure drop	For each pre-treatment
	For each membrane unit
Flow meter	Flow rate of raw water pumped to the plant
Permeability	Initial permeability of modules (ideally for each module) measured with very clean water[2] under controlled conditions (reference measurement)
	Permeability of each unit during operation
Rate of recovery	Overall rate, taking into account internal loss (membrane cleaning, pre-treatments, leaks, etc.)
Rinsing/cleaning	Number, how often, duration, products used to rinse/clean pre-treatments
	Pre-treatment replacement rate
	Factor that triggers membrane cleaning
	Number, how often, duration, products used to rinse/clean membranes

[a] See the list of parameters in annexes 2 and 3.

[2] Very clean water is one in which turbidity is less than 0.1 NTU, conductivity is below 50 µS/cm and total organic carbon content is less than 0.2 mg/L.

ALARMS

Membrane filtration treatment methods must have the following alarms:

- integrity failure of a membrane train unit;
- greater loss of permeability than the procedure test value;
- pre-treatment pressure drop greater than the process control threshold;
- membrane filtration pressure drop greater than process control threshold;
- turbidity greater than or equal to 0.1 NTU at the outlet of a unit;
- pressure at the intake of a train unit greater than the process control threshold;
- system shutdown due to power interruption (with connection to an emergency generator in order to continue producing drinking water);
- flow rates (raw water, concentrate or permeate) higher than process control thresholds.

ANNEX 4

CONFIDENTIALITY
AND NON-DISCLOSURE STATEMENT

ANNEXE 4
CONFIDENTIALITY
AND NON-DISCLOSURE STATEMENT

PREAMBLE

In this statement, the term *Committee* refers to the Comité sur les technologies de traitement en eau potable [drinking water treatment technologies committee], a joint MAMROT-MDDEP committee consisting of engineers appointed by each department and university experts who have agreed to this confidentiality and non-disclosure statement.

The term *Supplier* refers to a manufacturer or distributor active in the field of drinking water treatment.

Before working with the Committee to produce a technical assessment sheet for a water treatment technology for publication on the MDDEP website, the supplier may have to share some confidential information with the Committee. The supplier may also have to reveal information concerning the supplier's business.

This statement protects the parties and their confidential information during the negotiations leading up to the publication of a technical assessment sheet. It protects the parties even if they eventually decide not to publish the technical information sheet.

THE COMMITTEE AGREES AS FOLLOWS:

1. Confidential information is any information disclosed in written or any other form, marked as "confidential" or "secret". The date of disclosure must be indicated on the document. When the information is disclosed verbally, the confidential information must be confirmed within a reasonable time by a written document that is dated and marked "confidential" or "secret".

2. Except with written authorization from the supplier, the Committee agrees not to disclose to a third party or use

    2.1. Any confidential information about the supplier's business, including but not limited to trade secrets, business plans and client data, brought to the Committee's attention as a result of joint work;
    2.2. Any confidential information, including but not limited to confidential information contains in any document, computer program, software, or any other material of any kind provided by the supplier for the purpose of preparing a technical assessment sheet.

3. More generally, the Committee undertakes

    3.1. To establish and implement all appropriate measures to preserve the confidential nature of this statement;
    3.2. Not to disclose, transmit, apply or otherwise use the information contained in or concerning this statement for its own purposes or the purposes of any other person;
    3.3. To take all appropriate measures to ensure that, where applicable, its associates, administrators, representatives, agents, mandataries, directors, employees and related persons respect the confidential nature of this statement.

4. The obligations described in the preceding paragraphs do not apply to information that

    4.1. Is already publicly available;
    4.2. Is known within the industry;
    4.3. Is not considered by the supplier to be confidential information;
    4.4. Was disclosed to the Committee by a third party in good faith acting at arm's length;
    4.5. Must be disclosed by law;
    4.6. Is developed independently without the use of confidential information disclosed by the supplier.

5. The obligation of confidentiality subsists for a period of five (5) years after the information is disclosed.

6. The provisions of this statement cannot be interpreted as creating any form of association or partnership between the parties or as entrusting a mandate to any party.

7. This document constitutes the full and complete statement. No statement, representation, promise or condition not contained in this document may be admitted to contradict, modify or affect in any way the terms of this statement.

8. This statement is subject only to the laws in force in the province of Québec, Canada.

CONFIDENTIALITY AND NON-DISCLOSURE STATEMENT

The undersigned, …….., declaring himself/herself duly authorized, undertakes to comply with this confidentiality and non-disclosure statement.

_____

- Signed at …… on ……