Centre d’expertise en analyse environnementale du Québec

Methods for taking and preserving samples for the application of the Regulation respecting the quality of drinking water

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Please be advised that the numbers of one or more of the regulations listed below have been changed since this document was originally published. Following the adoption of the *Act respecting the Compilation of Québec Laws and Regulations*, RSQ, c R-2.2.0.0.2, the ministère de la Justice began on January 1, 2010 to change the numbering of selected regulations, including those related to the *Environment Quality Act*, RSQ, c Q-2.

Please visit http://www.mddep.gouv.qc.ca/publications/lois-reglem-en.htm for more details about this change.

INTRODUCTION

When evaluating the quality of water, collaboration among data users, sample takers and laboratory staff is essential. Hence, this manual presents the different methods for taking and preserving the samples required to analyze the parameters set forth in the *Regulation respecting the quality of drinking water* (R.S.Q., c. Q-2, r. **40**)*.

Firstly, the manual informs sample takers of the basic safety and preparatory measures that must be taken prior to sampling. Understanding the principles behind the methods of analysis is also important, as sampling protocols can vary widely in accordance with these methods.

In this context, the manual goes on to present the suggested sample volumes, preservatives, types of containers as well as deadlines between sampling, extraction and analysis, if any. This part integrates the information provided in the "Methods for taking and preserving samples" section of the analytical methods of the Centre d'expertise en analyse environnementale du Québec (CEAEQ) available on the following website: www.ceaeq.gouv.qc.ca.

SAMPLING METHODS

The quality of analytical findings is directly affected by the way sampling is carried out. To minimize contamination and ensure sample integrity, basic precautions are necessary. Take a sloppy approach to sampling and your samples will be contaminated. The desired sensitivity and quantification limits may be used to define the volume and sample type to be taken. The person taking the sample or the person in charge of a distribution system must ensure the quality, preservation and adequate transportation of samples sent to accredited laboratories. Close cooperation with the accredited laboratory that will receive the samples is essential. Concerning the sampling of distributed water, the following precautions must be taken to avoid contamination problems:

- use taps that are accessible to users, preferably those intended only for sampling;
- make sure that cold water is used and that the hot water tap is shut;
- avoid using single handle taps (flow and temperature), because it is more difficult to make sure the hot water tap is fully shut off;
- use taps located inside a building or in a location protected from wind and weather;
- avoid using outside taps that are used to connect watering hoses;
- take a water sample that is representative of the drinking water distribution system using a tap that is not connected to an individual water treatment appliance or system;

*** Due to a change to regulation numbering that followed adoption of the *Act respecting the Compilation of Québec Laws and Regulations*, RSQ, c R-2.2.0.0.2, regulation 40 henceforth replaces former regulation 18.1.1.**

- take a water sample that is representative of the water consumed by users when individual water treatment appliances are installed in replacement of a central treatment unit, using a tap that is connected to an individual water treatment appliance or system and in accordance with the *Regulation respecting the quality of drinking water*, section 9.1;

- remove all objects found under the spout, such as vents, screens, rose heads and hoses; if it is impossible to remove them, choose another tap;

- clean the outside and inside of the spout using a clean single-use piece of cotton and commercial bleach (containing about 5% sodium hypochlorite) for all samples intended for microbiological analyses;

- let the tap run for 5 minutes before taking a sample in order to ensure that the sample is representative of the water in the distribution system;

- make sure water pressure at the tap is reasonable during sampling to avoid splashing and losing the preservatives that are inside the sampling containers;

- never smoke while taking or transporting samples;

- never take samples immediately after handling fuels, e.g., filling up a car with gas;

- avoid taking water samples in a bathroom that may contain chemical deodorants whose composition is identical with certain organic compounds that are being measured;

- never use containers of unknown origin to store samples (use only containers provided by a laboratory accredited by the Ministère du Développement durable, de l'Environnement et des Parcs);

- never rinse laboratory-provided containers containing preservatives required for analyses;

- ensure that containers used for analyses by the people responsible for the distribution system (at sampling sites) are prepared so as to be contaminant free;

- never use metal sampling devices if the analysis is meant to detect trace metals;

- store sampling material in clean and well ventilated areas;

- ensure that all containers are closed airtight after sampling;

- if possible, cool samples in the refrigerator before sending them (especially during summer);

- properly register all samples taken using appropriate forms;

- carefully pack samples to avoid breakage or leakage, and use properly labelled shipping containers for adequate handling;

- conduct business with a trustworthy transportation service for samples to be kept in good condition within the prescribed analytical timeframe.

Concerning the sampling of raw water, the following should be considered:

- take a sample from the raw water tap closest to the well-head;
- open the tap and let the water run long enough to empty the tap's run;
- drain the well from stagnant water prior to sampling (ideally, the well should be drained until the water temperature, electrical conductivity and pH are stable);
- be sure to take the sample when the well's pump is operating so that the water sampled is representative of the water in the well.

In addition to these broad precautionary principles, it is important that all samples intended for microbiological analyses be taken in suitable, sterile containers provided by the accredited laboratory, and that an empty space of at least 2.5 cm be left between the surface of the liquid and the container lid, facilitating the homogenization of the sample when it is analyzed in the laboratory. Every care must be taken during sampling to avoid contamination (i.e., avoid inserting fingers or any other object in the container's neck or lid and, when sampling, limit exposure of the container to air).

When taking samples intended for chemical analysis of the volatile organic compounds listed in Table 1 of this manual, you must take field blanks along with the sampling bottles. The purpose of field blanks is to determine whether or not contamination has arisen during sampling or shipping. Field blanks are prepared by the laboratory by filling containers with purified water and the proper preservatives. These are to be taken along and handled on the sampling site, then taken back to the laboratory as if they were samples. They must therefore be opened on the sampling site and remain open for as long as the sampling goes on. Field blanks must always be carried along with the other containers before, during and after sampling, and sent along with the samples to the laboratory.

PRESERVATION METHODS

The preservation methods for the various analysis parameters provided in the *Regulation respecting the quality of drinking water* are described in the tables herein. These preservation methods are intimately linked to the analysis methods used. It is of paramount importance to work together with the laboratory personnel to obtain the required additional information. Over and above the specific provisions described in these tables, the following general points apply:

- all samples for chemical analysis must be kept at a temperature of about 4°C between the time they are taken and the time they are received by the laboratory (use cool boxes and cooling agents);
- all samples for microbiological analysis must be kept at a temperature lower than 10°C between the time they are taken and the time they are received by the laboratory (use cool boxes and cooling agents);
    - upon arrival of the samples at the laboratory the temperature is taken with an infrared thermometer;

- this does not apply to samples taken less than one hour before their arrival at the laboratory if they meet the required cooling conditions;

- in microbiology, samples must not exceed 12°C (i.e., 10°C plus 2°C). When applicable, the person responsible for the distribution system must be notified that the temperature criterion has been exceeded so that he/she can be ready to deal with any potential problems;

- in microbiology, organic chemistry and inorganic chemistry (turbidity), samples received frozen, partly frozen or with frazil crystals must be rejected;

- ice boxes must be clean and, if possible, reserved for drinking water analysis and cleaned regularly. It should be noted that preservation and transportation are under the responsibility of the sample taker or person responsible for the distribution system and that it is essential to work in close cooperation with the accredited laboratory.

Preservation methods for organic parameters

	Preservative	Container	Suggested quantity (l)	Conservation time (days)	Comment
PESTICIDES					
Aldicarb and metabolites	TS-1	P	0.25	7	
Aldrin and dieldrin	N	PY	1	7	
Atrazine and metabolites	N	PY	1	7	
Azinphos-methyl	N	PY	1	7	
Bendiocarb	N	PY	1	7	
Bromoxynil	AS	VT	1	21	
Carbaryl	N	PY	1	7	
Carbofuran	N	PY	1	7	
Chlorpyrifos	N	PY	1	7	
Cyanazine	N	PY	1	7	
Diazinon	N	PY	1	7	
Dicamba	AS	VT	1	21	
2,4-dichlorophenoxyacetic, acid (2,4-D)	AS	VT	1	21	
Diclofop-methyl	AS	VT	1	21	
Dimethoate	N	PY	1	7	
Dinoseb	AS	VT	1	21	
Diquat	N	P	0.25	7	Can be stored 28 days at -20 ° C
Diuron	N	PY	1	7	
Glyphosate	TS-1	P	0.25	14	Can be stored 28 days at -20 ° C
Malathion	N	PY	1	7	
Methoxychlor	N	PY	1	7	
Metolachlor	N	PY	1	7	
Metribuzin	N	PY	1	7	
Paraquat (dichlorides)	N	P	0.25	7	Can be stored 28 days at -20 ° C
Parathion	N	PY	1	7	
Phorate	N	PY	1	7	
Picloram	AS	VT	1	21	
Simazine	N	PY	1	7	
Terbufos	N	PY	1	7	
Trifluralin	N	PY	1	7	

	Preservative	Container	Suggested quantity (l)	Conservation time (days)	Comment
OTHER ORGANIC SUBSTANCES					
Benzene	TSS	VI	0.04	7	3 bottles
Benzo (a) pyrene	AS	VAT	1	7	
Vinyl chloride	TSS	VI	0.04	7	3 bottles
1,1- dichloroethylene	TSS	VI	0.04	7	3 bottles
1,2-dichlorobenzene	TSS	VI	0.04	7	3 bottles
1,4-dichlorobenzene	TSS	VI	0.04	7	3 bottles
1,2-dichloroethane	TSS	VI	0.04	7	3 bottles
2,4-dichlorophenol	AS	VI	1	14	
Dichloromethane	TSS	VI	0.04	7	3 bottles
Monochlorobenzene	TSS	VI	0.04	7	3 bottles
Nitrilotriacetic acid (NTA)	N	VB, P	0.125	7	3 bottles
Pentachlorophenol	AS	VI	1	14	
2,3,4,6-tetrachlorophenol	AS	VI	1	14	
Tetrachloroethylene	TSS	VI	0.04	7	3 bottles
Carbon tetrachloride	TSS	VI	0.04	7	3 bottles
2,4,6-trichlorophenol	AS	VI	1	14	
Trichloroethylene	TSS	VI	0.04	7	3 bottles
OTHERS					
Total trihalomethanes (chloroform, bromodichloromethane, chlorodibromomethane and bromoform)	TSS	VI	0.04	7	3 bottles

Preservation methods for inorganic substances

	Preservative	Container	Suggested quantity (l)	Conservation time (days)	Comment
Antimony	AN	P, V	0.125	180	
Arsenic	AN	P, V	0.125	180	
Baryum	AN	P, V	0.125	180	
Boron	AN	P, V	0.125	180	
Bromates	EDA	P	0.125	28	
Cadmium	AN	P, V	0.125	180	
Total chromium	AN	P, V	0.125	180	
Copper	AN	P, V	0.125	180	
Cyanides	NaOH	P, V	0.100	14	
Fluorides	N	P	0.125	28	
Mercury	AC + or	PD	0.012	28	Can be preserved with AN. 250 ml if be analysed by Atomic absorption
Nitrates and nitrites	AS	P, V	0.125	28	
Nitrites	N	P, V	0.125	2	
pH	N	P, V	0.125	1	
Lead	AN	P, V	0.125	180	
Selenium	AN	P, V	0.125	180	
Turbidity	N	P, V	0.125	2	
Uranium	AN	P, V	0.125	180	
OTHERS – Sampling site					
Chloramines	N	P or V	0.05	30 minutes	
Free residual chlorine	N	P or V	0.05	30 minutes	

Preservation methods for microbiological parameters

	Preservative	Container	Suggested quantity (l)	Conservation time (days)	Comment
Fecal coliforms or *Escherichia coli*	TS	PPS	0.100	2	Leave 2,5 cm between the liquid and cap to facilitate stirring
Total coliforms	TS	PPS	0.100	2	Leave 2,5 cm between the liquid and cap to facilitate stirring
Male specific coliphages	TS	PPS	0.100	2	Leave 2,5 cm between the liquid and cap to facilitate stirring
Enterococci	TS	PPS	0.100	2	Leave 2,5 cm between the liquid and cap to facilitate stirring

LEGEND

CONTAINER	
P	Bottles and lid coatings are made of the following plastics: high or low density polyethylene or equivalent
PD	Plastic bottle decontaminated beforehand
PPS	Sterile polypropylene bottle
PY	Clear glass bottle Pyrex or amber with cap inner surface of Teflon or aluminium foil
V	Clear glass bottle or amber
VAT	Glass bottle amber with cap inner surface of Teflon or teflon sheet
VB	Clear glass bottle or amber with cap inner surface of Teflon or aluminium foil
VI	Clear glass bottle or amber with a septum cap inner with Teflon, filled to capacity (without air bubbles)
VT	Clear glass bottle or amber with cap inner surface of Teflon or teflon sheet
PRESERVATIVE	
Ac + or	Add 120 µl gold solution 10 mg/l and 120 µl HCl Seastar ™ per 12 ml of sample taken
AN	Acidify sample to pH<2 with HNO_3
AS	Acidify sample to pH<2 with H_2SO_4
EDA	Add 1 ml ethylene diamine to 45 mg/l per litre of sample taken
N	No preservative required
NaOH	Overbase to pH>12 with NaOH 10 N
TS	Sodium thiosulfate at a final concentration of 0.01% (w/v)
TS-1	Sodium thiosulfate 1% w/v (250 µl per 250 ml of sample taken)
TSS	Sodium thiosulfate (40 mg)