Sampling Procedures for Drinking Waters

1 PURPOSE

This standard operating procedure outlines details for collection of drinking water samples for chemical, microbiological and radiological analysis. Details of the type of sample containers and preservatives to be used are also included. These procedures should be utilized by drinking water service providers. The sampling procedures and details of containers and preservatives are based on requirements outlined in AS/NZS 5667.1 (1998).

2 BACKGROUND

Drinking water service providers are required to monitor and report on drinking water quality in accordance with a monitoring notice issued by the regulator (Department of Natural Resources and Water (NRW)) under the *Water Supply (Safety and Reliability) Act 2008*. This will require monitoring for *Escherichia coli* (*E. coli*) in accordance with the requirements of the *Public Heath Regulation 2005* and for other parameters as appropriate to individual schemes.

This monitoring program will be used to identify gaps in water quality information and to help service providers identify key water quality parameters for their schemes for the development of their Drinking Water Quality Management Plans (DWQMP). Queensland Health, in consultation with NRW and service providers will assist in an audit of drinking water supplies for the following parameters as required for individual schemes:

- Microbiological Testing (Micro) – *E. coli*
- Standard Water Analysis (SWA)
- Heavy Metals (HM) (Al, As, Cd, Zn, Cr, Ni, Fe, Mn, Cu, Zn)
- Mercury (Hg)
- Fluoride (F)
- Pesticides
- Phytoplankton (algae, cyanobacteria)
- Disinfection By-Products – DBPs (Trihalomethanes and Haloacetic acids)
- Radiological testing - Alpha and Beta Activity

At the completion of the survey, an on-going mandatory monitoring program will be implemented to best assess drinking waters supplied by drinking water service providers throughout Queensland.

3 REFERENCES

3.1 AS/NZS 5667.1 (1998) Water Quality – Sampling: Guidance on the design of sampling programs, sampling techniques and preservation and handling of samples.

4 PRELIMINARY CONSIDERATIONS

In general, all samples that are collected for analysis must be representative of the water facility being tested. In some cases, consideration should be given to submission of composite samples to minimize sample numbers. Once samples are collected in their respective containers (see Table 2), avoid prolonged exposure to the sun. It is good practice to immediately place collected samples into the carriage containers (e.g. esky). In addition, samples should be delivered as soon as possible to the laboratory. Always label each of the sample containers with a unique identifier and any other information that may be relevant. Furthermore, record the name of sampler, date and time of

sampling, location of sample and the unique identifier on laboratory sample submission forms (if possible, restrict the unique identifier to a simple alpha/numeric number).

Water samples may be collected from a tap outlet, standing water body or a bore and some important sampling procedures are as follows:

4.1 From a tap (reticulated town water, tank water, other storage facilities with a tap outlet):

- If there are several taps in the area of test, choose a tap which is most frequently used.
- Remove any external fittings such as filters and remove any contaminants (e.g. grease, slime, sediment build-up etc) around the spout with a clean cloth. Tap cleanliness is particularly important with microbiological testing. Tap outlets which are suspected to be contaminated must be disinfected first before taking the sample. Disinfect by swabbing the outside of the tap and as much of the inside as possible with a 0.1% sodium hypochlorite solution. Prepare the 0.1% solution by diluting commercially available sodium hypochlorite solution (approx 10%) by a factor of 100. Allow to stand for a few minutes (to allow full disinfection) before proceeding to the next step shown below.

  CAUTION: Sodium hypochlorite is a strong oxidizing agent and is highly corrosive. Handle with great care and wear appropriate PPE (gloves, safety glasses). If contact with skin or clothing occurs, wash immediately with copious quantities of water.

- Turn the tap on to a steady stream and run for at least 2-3 minutes to remove any stagnant water in the plumbing network.
- Depending on the parameter(s) you want tested, proceed as shown below in Table 1.

4.2 Surface waters – shallow and deep (lakes, rivers, creeks, streams etc)

Surface Water Samples (shallow depth)

- The sample should be representative of the source of supply. In this respect, it is important to consider location and depth of the water. Taking samples very close to the bank may not be representative of the source of supply.
- For a surface water sample, simply hold the bottle firmly and plunge the neck downwards to a depth of about 0.5m. Turn the bottle until the neck points upward and mouth is directed towards the current (if present). If a sample is taken from a boat, always collect the sample from the upstream side of the boat.
- Alternatively, a clean bucket (of about 10L capacity) or other suitable vessel such as a large beaker can be used to collect the surface sample. Dip the bucket or beaker into the stream, withdraw and then transfer to the laboratory sample container.
- If a composite sample is to be submitted for analysis, pour equal portions of freshly collected samples into a suitable container.
- Depending on the parameter(s) you want tested, proceed as shown below in Table 1.

Depth Water Samples(deep waters)

- Collect the water sample using a suitable depth sampling device (e.g. hosepipe, grab, pump etc). Be careful not to disturb bottom sediment.
- If a composite sample is to be submitted for analysis, pour equal portions of freshly collected samples into the appropriate container (see Table 2).
- Depending on the parameter(s) you want tested, proceed as shown below in Table 1.

4.3 Groundwaters (bores, wells - pump operated)

- Operate the pump to flush out stagnant water from the pipe. Operation time will depend on the depth of the bore and diameter of the pipe-work.
- Do not sample a newly drilled bore/well or a rarely used one unless the facility has been pumped for more than 48 hours.

- Collect the sample from the tap which should be located on the discharge side of the pump (do not collect the water sample from a tap located on the inlet side to the pump as this will not be representative of the water reaching the users).
- Depending on the parameter(s) you want tested, proceed as shown below in Table 1.

5 COLLECTION OF WATER SAMPLES

Table 1 indicates procedures in collecting water samples for different parameters.

Table 1: Collecting water samples for different parameters.

Parameter	Method of Collection
Pesticides and DBPs (trihalomethanes and haloacetic acids)	• If the sample requires preservation (see Table 2), add the preservative (sodium thiosulphate for pesticides and ammonium chloride for DBPs) to the empty sample container. • For pesticide samples, collect the water sample as indicated in 4.1, 4.2 or 4.3 (depending on the situation) and fill the container to near full capacity. However, when samples are collected for the DBPs (i.e. trihalomethanes and haloacetic acids) fill the bottle to just overflowing (but do not let overflow) to exclude all air in the bottle i.e. no air bubbles can pass through the water sample. **Do not pre-rinse the bottle and do not let the bottle overfill.** • Seal the bottle with the top ensuring that the top for pesticides contains an inner Teflon liner seal. If there is no Teflon liner, cover the top of the bottle with aluminium foil and then seal with the cap. • Agitate the bottle by hand for 1 minute to disperse the preservative (if added). • Label the bottle and place in an esky at 4°C (using frozen briquettes) or other suitable container for transportation to the laboratory. **Do not freeze**. • For pesticide analyses, please indicate what pesticides or herbicides are being used in the area; if this is not known, please indicate what crops are grown in the area.
Phytoplankton	• Samples for phytoplankton identification and enumeration are usually collected from standing water bodies – please refer to Section 4.2 for method of collection. • A representative sample may be obtained by sampling several sites and pooling these samples at equal volume to produce a composite. Alternatively, individual samples may be submitted. • Collect the water sample (shallow or deep waters) as described in 4.2 above and add 5mL lugol preservative if delivery time to the laboratory is expected to exceed 48hrs. If lugol is added, the water sample will change colour to a straw colour. • Seal the bottle and mix well. • Label the bottle and place in an esky at 4°C (using frozen briquettes) or other suitable carry container for transportation to the laboratory. • Generally, sampling frequency is weekly to detect changes in algal species and abundance. Standing waters may only require fortnightly sampling especially in times of low cell growth. • Routine sampling should be conducted within the same predetermined time period in the day as time of day may be critical to the result.
SWA, HM, Hg, F, Alpha Beta Activity	• Collect the sample as indicated in 4.1, 4.2 or 4.3 depending on the situation and rinse container out with the water at least twice and then fill to near full capacity. • Where applicable, add the appropriate preservative to the sample container (see Table 2). • Seal the bottle with the cap and mix well to disperse the preservative. • Label the bottle and place in a suitable container for transportation to the laboratory. Samples for SWA, HM, Hg and F can be transported at ambient temperatures but samples for alpha beta activity should ideally be transported chilled in an esky at 4°C.
Microbiological	• Fill the container to near full capacity as indicated in Sections 4.1, 4.2 or 4.3 (depending on the situation) and seal with the yellow screw cap. **Do not put fingers inside the container at any time and do not rinse the container.** • Please note that the container for microbiological testing already has preservative added. • Mix well to disperse the preservative. • Label the jar and place in esky at 5°C ± 3°C (using frozen briquettes) or other container for transportation to the laboratory. • For meaningful results, the samples must reach the laboratory within 24 hrs.

6 CONTAINERS

Details of sample containers and preservatives for water sampling are shown in Table 2.

CAUTION: Care should be taken when handling all preservatives. In particular, nitric acid is extremely corrosive and can cause severe burning or blindness if splashed into the eyes. Always use gloves and safety glasses when handling preservatives. If contact with skin or clothing occurs with any of the preservatives, wash immediately with copious quantities of water.

Table 2: Sample containers for water samples requiring analyses for parameters shown below. See Appendix for illustrations of the bottles.

Parameter	Container	Washing	Volume Required	Preservative	Comments
Alpha beta Activity	P (code MB/P4)	Acid washed	500mL	Nitric Acid (1.5%) Note 1 and chill	Filter samples if particulate matter is present. Use (0.45µm) Transport chilled to the laboratory.
Disinfection By-Products	G (code MB/G8)	Solvent washed	200mL	Ammonium Chloride (0.2g) (Note 2)	Transport chilled to the laboratory.
Heavy Metals (Al, As, Cd, Zn, Cr, Ni, Fe, Mn, Cu, Zn)	P (code MB/P6)	Acid washed	250mL	Nitric Acid (1%) (Note 3)	May be transported at ambient temperature.
Fluoride	P (code MB/P5)	Detergent washed	250mL	Nil	May be transported at ambient temperature.
Mercury	G (code MB/G7)	Acid washed	250mL	Nitric Acid /Potassium Dichromate (approx 1%) (Note 4)	May be transported at ambient temperature.
Microbiological Testing (*E. coli*)	Sterile yellow screw cap polystyrene (code NW/BOTT)	Sterile	250mL	30mg sodium thiosulphate and chill	Samples must be kept chilled and delivered to the laboratory within 24hr. Preservative already added to the container.
Pesticides	G (code MB/G1)	Solvent washed	1L	80mg sodium thiosulphate and chill (Note 5)	If the water is not chlorinated there is no need to add the sodium thiosulphate preservative. Transport chilled to the laboratory.
Phytoplankton	P (code MB/P2)	Detergent washed	1L	5mL Lugol and chill	Use the preservative only if the sample cannot be submitted to the laboratory within 48hr. Transport chilled to the laboratory.
Standard Water Analysis (SWA)	P (code MB/P2)	Detergent washed	1L	Nil	May be transported at ambient temperature.

Notes:

1. Add 7.5mL concentrated nitric acid (from supplied container) to approximately 500mL sample, replace cap and mix well.
2. Add the ammonium chloride solid to the water sample, replace cap and mix well.
3. Add 2.5mL concentrated nitric acid (from supplied container) to approximately 250mL sample, replace cap and mix well.
4. Add 4mL of the prepared concentrated nitric acid/potassium dichromate mixture (2 mL concentrated HNO_3 plus 2mL of $K_2Cr_2O_7$ 50mg/mL) to approximately 250mL sample and mix well.
5. If the water has been chlorinated, add 80mg sodium thiosulphate for preservation.
6. P = Plastic (High Density Polyethylene - No 2 on Recycle triangle)
   G = Amber Glass Bottles with Teflon liner seal

7 ORDERING CONTAINERS

Please use QHFSS form 18292 for ordering bottles and containers which are free of charge for Local Government clients. Simply fill out the form and fax the completed form to QHFSS (Fax 3274 9022). Copies of form 18292 may be obtained by contacting any of the contacts shown below or by contacting Dora Bertini on Ph 3274 9066.

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8 CONTACTS

Microbiological: John Bates Ph 3274 9101 or Bruce Gray Ph 3274 9075
Radiological: Ross Kleinschmidt Ph 3274 9124
Disinfection By-Products/Pesticides/Phytoplanktons: Mary Hodge Ph 3274 9087 or Simon Christen Ph 3274 9088
Standard Water Analysis/Heavy metals/Mercury/Fluoride: Henry Olszowy Ph 3274 9071 or Eugene Lee Ph 3274 9058

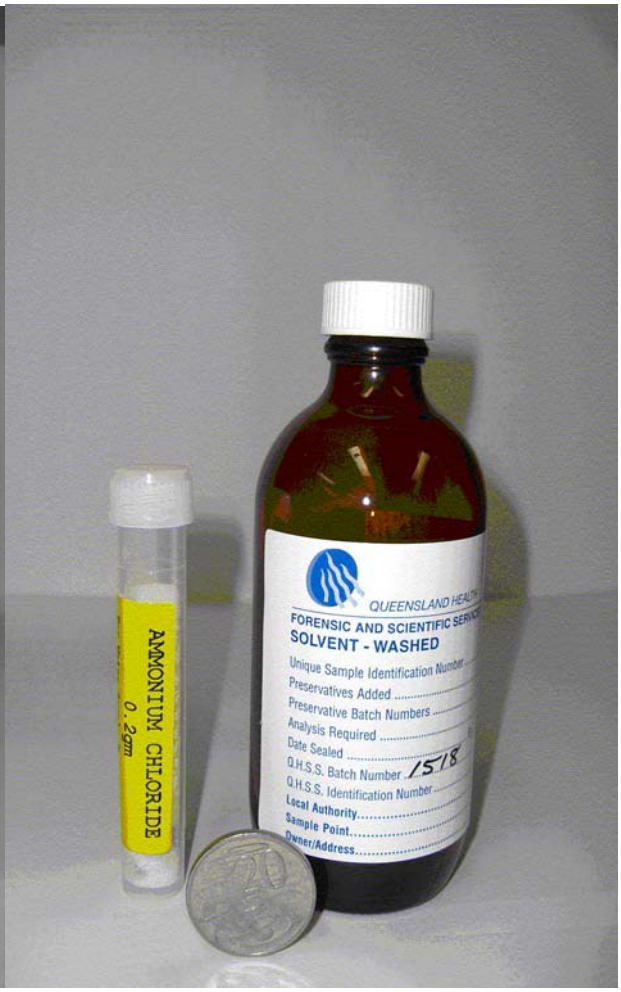
9 AMENDMENT HISTORY

Version	Date	Author	Changes
0 (New)	September 2008	Dr H A Olszowy	First Edition
1	October 2008	Dr H A Olszowy	Added further information to Section 2 Background

APPENDIX

Illustrations of Containers

MB/P4 - Red label acid washed plastic 500mL for alpha beta activity, preservative 7.5mL concentrated nitric acid.



MB/G8 – Blue label solvent washed glass 200mL for disinfection by-products, preservative 0.2g ammonium chloride.

APPENDIX (Cont)

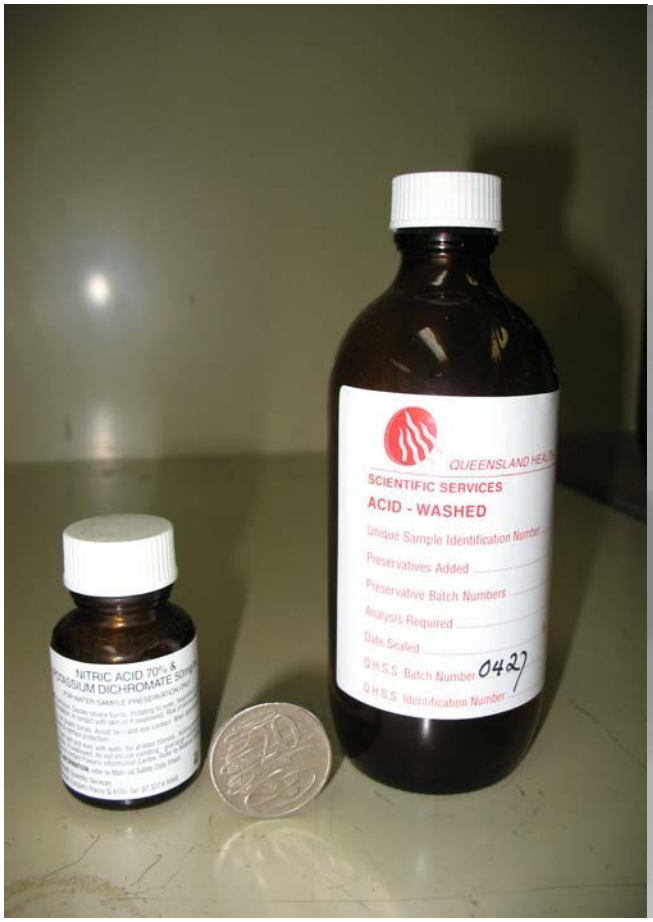
Illustrations of Containers

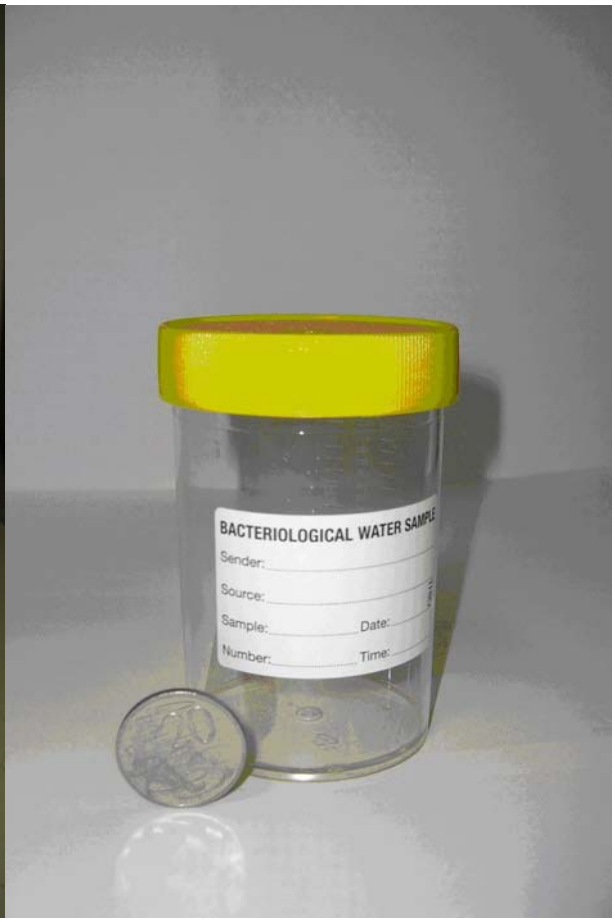
MB/P6 – Red label acid washed plastic 250mL for heavy metals; preservative 2.5mL concentrated nitric acid.

MB/P5 – Green label detergent washed 250mL plastic bottle for fluoride; no preservative required.

APPENDIX (Cont)

Illustrations of Containers





MB/G7 – Red label acid washed 250mL glass bottle for mercury; preservative consists of 2mL concentrated nitric acid plus 2mL potassium dichromate.

NW/BOTT – Yellow screw cap 250mL sterile polystyrene jar for microbiological testing; 30mg sodium thiosulphate preservative has already been added to the jar.

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APPENDIX (Cont)

Illustrations of Containers

MB/G1 – Blue label solvent washed amber glass bottle for pesticides, preservative 80mg sodium thiosulphate only if water is chlorinated. Keep samples chilled.

MB/P2 - Green label detergent washed plastic bottle for standard water analysis (SWA) and phytoplankton. No preservative is required for SWA. For phytoplankton, use 5mL lugol (not shown) as preservative only if the sample cannot be submitted to the laboratory within 48hr. Transport chilled to the laboratory.