

## Background to water quality sampling using automated sampling equipment

### 1 Purpose and scope

This document provides background information on water quality sampling using automated sampling equipment.

### 2 Associated documents

*Physical and chemical assessment: Water quality sampling using automated sampling equipment*

### 3 Introduction

Automated sampling devices are used to collect water samples when it is not possible to collect them manually. For example:

- when sampling flood waters where it is unsafe to collect a sample manually e.g. high river levels and high flows
- when sampling stormwater drains that can have flashy unpredictable flows
- where there is a requirement to sample at regular intervals throughout a 24 hour period. For example, to capture the rise or fall of a hydrograph for calculating loads.

In these situations an automated sampling device can be used to collect grab or composite samples. Types of automated sampling devices include refrigerated or non-refrigerated automatic pump samplers (auto-samplers) (Figure 1a) and rising stage samplers (Figure 1b). An understanding of the stream height at any given time is required to provide sample context. This may be via real time monitored river height data, or installed depth loggers which can be interrogated following flow events.

### 4 Automatic pump samplers (auto-samplers)

Auto-samplers (Figure 1a) are comprised of a number of bottles in a carousel or a single receptacle, a sample intake line that is fixed in place within the stream connected to a pump and a computer controlled data logger that requires programming.

The auto-sampler is programmed to be 'triggered' when a pre-entered set of conditions are met, for example a certain:

- stream height
- time of day
- change in temperature
- rate of rise or fall of the stream level
- turbidity reading.

Once triggered, the auto-samplers start sampling according to the program set.



(a)



(b)

**Figure 1: Automated sampling equipment: (a) refrigerated automatic pump sampler (Photo credit: DES) (b) rising stage sampler (Photo credit: Hyquest Solutions)**

Installation of auto-samplers should be in accordance with the manufacturer's instructions. When using auto-samplers for collecting water samples, it is important to follow procedures for sample handling, sample holding times and sample containers for the analyte being measured.

When using auto-samplers, the possibility of exchange between the sample and the walls of the sampling lines (tubing or pipes) must be considered. The time of contact between the sample and the wall material is important and the automatic pump sampler must be programmed to flush out residues of previous samples before liquid is delivered into the sample container.

## 5 Rising stage samplers

Rising stage samplers (Figure 1b) are useful for collection of samples from flashy, intermittent streams. Rising stage samplers are not refrigerated, and so samples are exposed to ambient temperatures and often light. The use of rising stage samplers may not be suitable for the collection of samples for the analysis of a number of analytes, particularly where analytes rapidly degrade or transform (e.g. ammonium and nitrate).

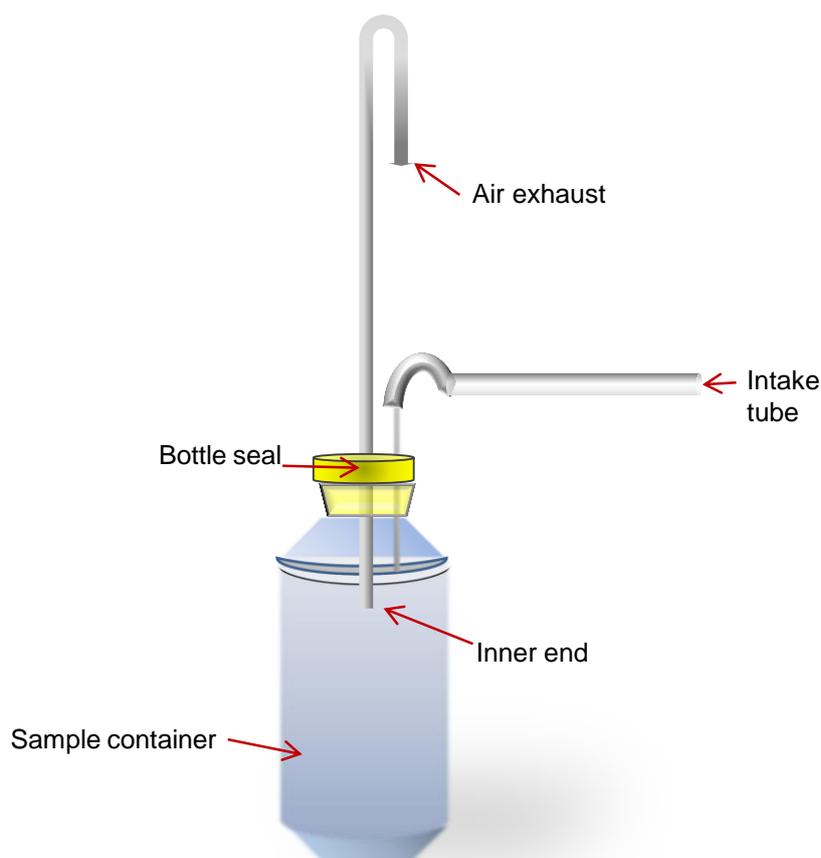
Rising stage sampling units must be securely mounted, one above the other at known height locations relative to river height, with adequate support provided to prevent dislodging by large logs and other debris. Samplers should be erected and installed so that they are pointing in a downstream direction (ensure the inflow assembly of each bottle is facing upstream). Recommended locations to protect samplers are:

- on the inside of river bends (debris tend to be swept to the outside of bends)

- adjacent to large trees (providing partial protection)
- downstream of small shrubs and trees (provide partial protection).

Sampling units must be routinely inspected for evidence of insects in the intake and breathing tubes—a common reason for missed samples (and contamination). Sampling intakes and exhaust tubes should be replaced or thoroughly washed with laboratory supplied ultra-pure water at regular time intervals (monthly or sooner as required) to avoid blockages and contamination.

With rising stage samplers, water samples are taken as the river level rises and samples can only be retrieved after the river level has receded. As the water rises it reaches the intake tube (Figure 2) and begins to fill the bottle. Sampling ceases when the level of the water in the bottle reaches the inner end of the air exhaust, which then prevents circulation through the sampler. An air lock forms in the intake tube and prevents further water from entering the bottle. The rate of rise in the river height must not exceed the rate of filling of the rising stage sampler, otherwise only a partial sample will be collected before the air exhaust forms and air lock.



**Figure 2: Schematic of the stage sampler bottle with intake and exhaust assembly**

The date and time at which sampling waters have risen above the intake tube should be recorded as the sample date and time. This can be determined by analysing the hydrograph during or after the event. Samples should be collected as soon as accessible following an event to maintain sample integrity.

## 6 References and additional reading

AS/NZS 5667.1: 1998, Australian/New Zealand Standard Water quality—*Sampling Part 1: Guidance on the design of sampling programs, sampling techniques.*