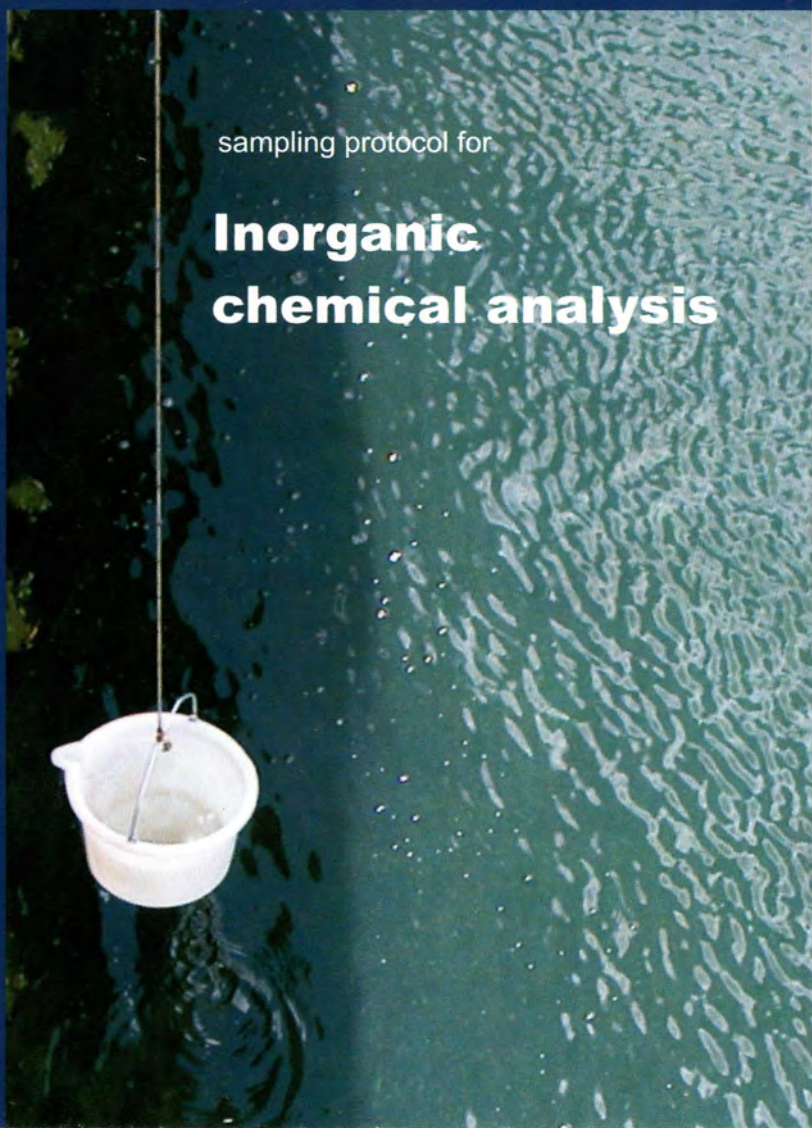


**Water
Resource
Quality
Monitoring**

VOLUME 1

sampling protocol for

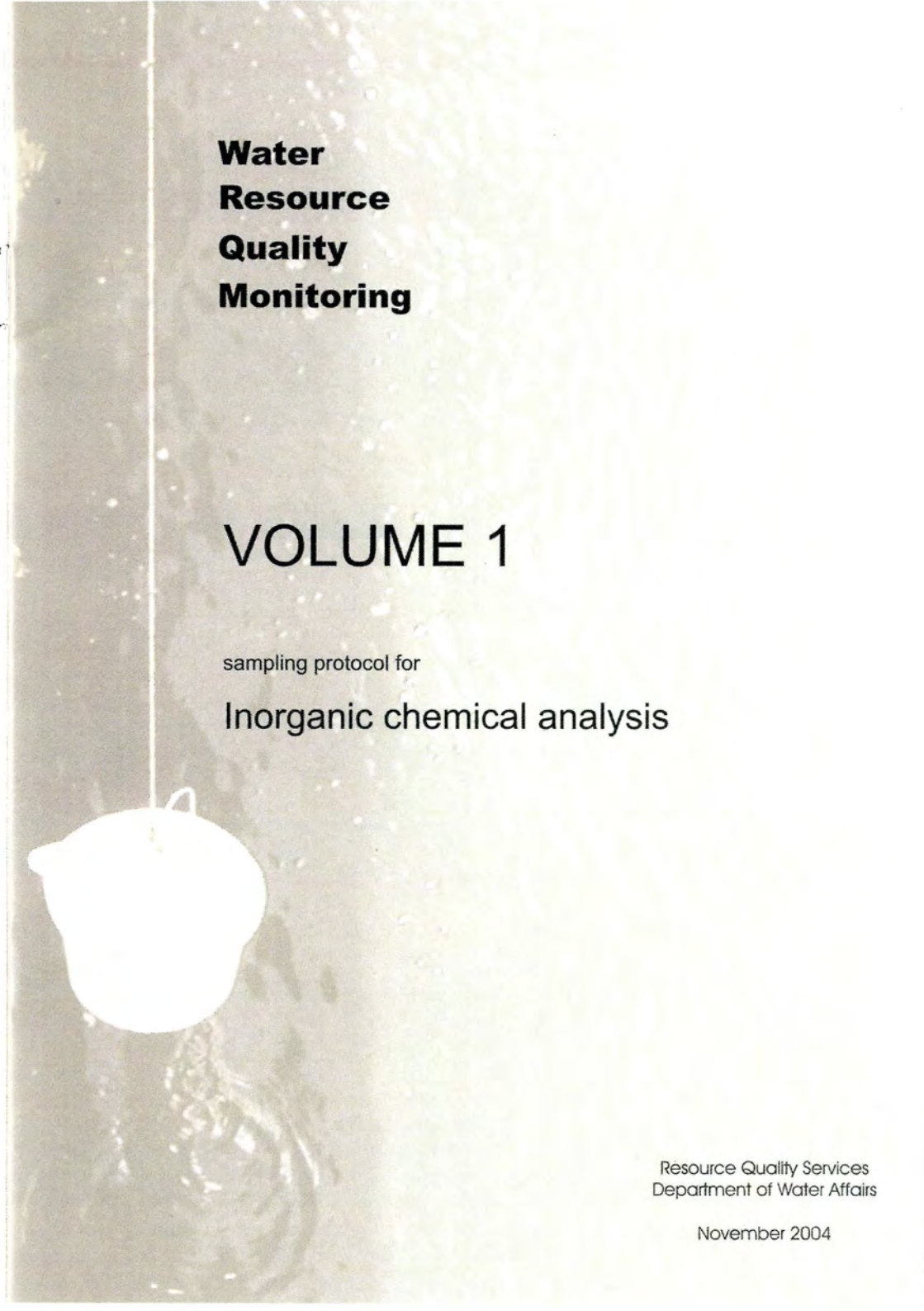
**Inorganic
chemical analysis**



September 2004

the dwaf
DEPARTMENT OF WATER AFFAIRS AND FORESTRY
www.dwaf.gov.za





**Water
Resource
Quality
Monitoring**

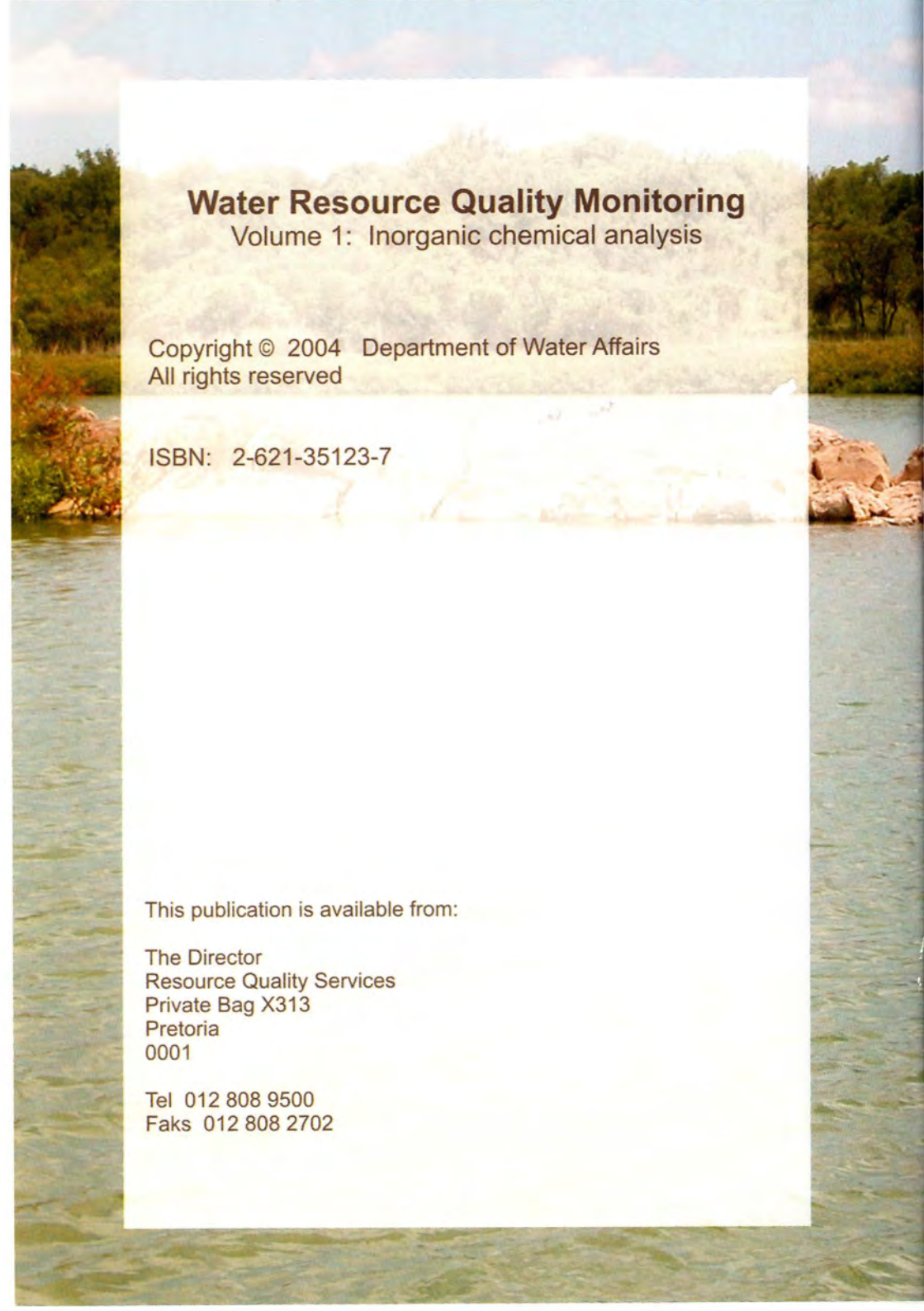
VOLUME 1

sampling protocol for

Inorganic chemical analysis

Resource Quality Services
Department of Water Affairs

November 2004



Water Resource Quality Monitoring

Volume 1: Inorganic chemical analysis

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Purpose of this monitoring guide

This Water Quality Monitoring guide is designed to be easy to use, with step by step instructions on the procedures to follow when collecting samples for specific programmes.

The guide is to be used by RQS personnel, regional officers and private monitors who need to collect data regarding the aquatic environment.

The guide also highlights problems and mistakes commonly associated with water quality monitoring.

Introduction

Water quality monitoring is an activity to collect information on the physical, chemical and biological characteristics of a water resource, be it a river, dam, estuary, wetland or subterraneous ground water.

Monitoring consists of 3 steps:

- i) Data acquisition
- ii) Data storage & manipulation
- iii) Information generation & dissemination

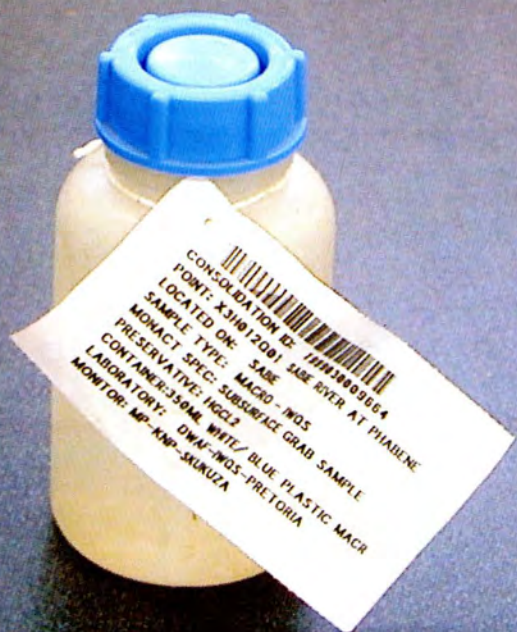
This guide addresses only the first component, namely, the data acquisition phase.



The type of information collected depends on the objectives of the monitoring program concerned.

The information can be worthless or misleading if sampling is not conducted properly.

INORGANIC CHEMICAL ANALYSIS



CONSOLIDATION ID: 1000009664
POINT: X31012001 SAGE RIVER AT PHARENE
LOCATED ON: SAGE
SAMPLE TYPE: MACRO - INOS
MONACT SPEC: SUBSURFACE GRAB SAMPLE
CONTAINER: 350ML WHITE / BLUE PLASTIC MACR
LABORATORY: DMW-INOS-PRETORIA
MONITOR: MP-KIP-SIKUKUZA

1. THE MONITORING NETWORK:

The National Chemical Monitoring Network is currently the largest network running at the RQS. Three types of samples are collected for this program.

The MACRO SAMPLE

This is the most common type of sample which is taken and analysed for major inorganic ions. The ions most commonly found in natural waters are the cations calcium, magnesium, sodium and potassium, and the anions bicarbonate, carbonate, chloride and sulphate (Dallas & Day, 1993) The results provide an indication of the ion balance and the inorganic chemical water quality of a water resource (dam, river etc.)



The TURBIDITY SAMPLE

Turbidity relates to how transparent water is. Turbid water is caused by suspended matter, such as clay, silt, fine organic and inorganic matter, soluble coloured organic compounds, plankton and other microscopic organisms that are held in suspension (Harris *et al.*, 1992)



The TRACE METAL SAMPLE

This is the type of sample which is analysed for metals that normally occur in very small (trace) quantities but their presence can either be beneficial, troublesome or toxic. The results, depending on the fraction that was analysed, will give an indication of metals that were dissolved or suspended in the water



2. WHERE TO COLLECT SAMPLES:

A clear distinction should be made between samples collected from flowing sources and samples collected from standing water.



STANDING WATER

- ▶ Dams
- ▶ Lakes
- ▶ Pans



**CONTINUE SAMPLING
REGARDLESS OF INFLOW**



FLOWING WATER

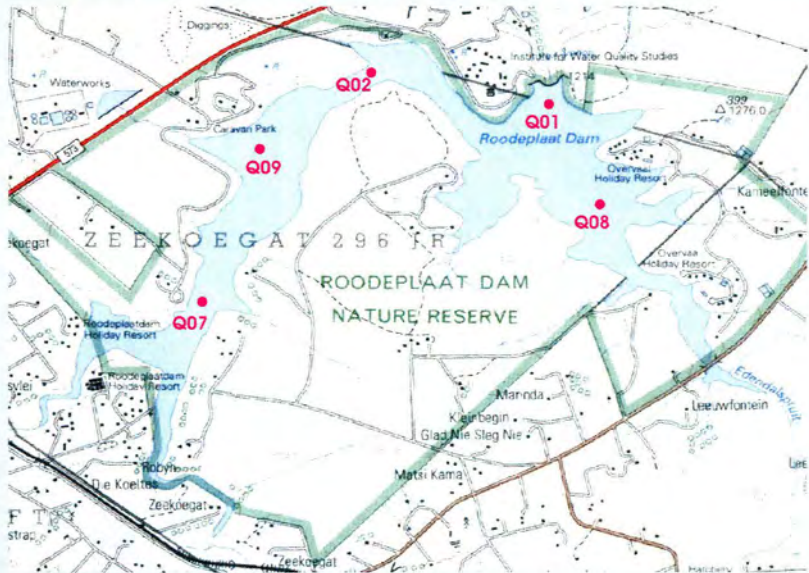
- ▶ Rivers
- ▶ Canals



**STOP SAMPLING WHEN
YOU OBSERVE NO FLOW**

2.1 Collecting samples from a dam:

- ▶ There can be more than one sampling point on a dam.



- ▶ Points are differentiated by adding a Q number after the dam number e.g. A2R009Q02.



- ▶ Point Q01 is always opposite the middle of the dam wall, and about 50-100 meters away from the wall.

2.2 Collecting samples from a river without

- ▶ Never sample on one side of an island. Make sure to
- ▶ When sampling downstream of a confluence, remember to select a point where water from both parts of the stream are thoroughly mixed.



2.3 Collecting samples from a river with a measuring/gauging structure:

- ▶ The ideal place to sample is directly below the weir where the water flows through.



- ▶ Turbidity samples are collected where the water is most turbulent (fast and well mixed).



- ▶ When the weir is flooded, it is safer to collect the sample downstream from the weir where water is still thoroughly mixed.

3. SAMPLING FREQUENCY:

- Sampling should take place at an optimum frequency, which are determined by Resource Quality Services. Data collectors are notified accordingly.

Department of Water Affairs and Forestry

MONITORING SCHEDULE

msdb@inf_05_iwqs

THIS MONITORING SCHEDULE IS EFFECTIVE FOR THE PERIOD 2003-10-21 TO 2003-12-31 AND REPLACES A

Monitor: DEPARTMENT OF WATER AFFAIRS AND FORESTRY- RESOURCE QUALITY SERVICES

Monitoring Point ID	Monitoring Point Name	Start & End Date	Action Frequency	Monitoring Action	Sample Type	Container
90240	A2R001Q01 HARTBEESPOORT DAM ON CROCODILE RIV: NEAR DAM WALL	1999-02-01 2009-12-31	2 WEEKLY ACTION FREQUENCY	25M FIXED DEPTH GRAB SAMPLE	MACRO - RQS	350ML WHITE/ BLUE PLASTIC MACR
90240	A2R001Q01 HARTBEESPOORT DAM ON CROCODILE RIV: NEAR DAM WALL	1999-02-01 2009-12-31	2 WEEKLY ACTION FREQUENCY	25M FIXED DEPTH GRAB SAMPLE	ALGAL ID-RQS LAB PREPARAT	1000ML WHITE PLASTIC BOTT-BIOL
90240	A2R001Q01 HARTBEESPOORT DAM ON CROCODILE RIV: NEAR DAM WALL	1999-10-15 2004-06-30	2 WEEKLY ACTION FREQUENCY	15M FIXED DEPTH GRAB SAMPLE	HYDROBI OLOGICA L-RQS LAB PREP.	1000ML WHITE PLASTIC BOTT-BIOL
90240	A2R001Q01 HARTBEESPOORT DAM ON CROCODILE RIV: NEAR DAM WALL	1999-10-15 2004-06-30	2 WEEKLY ACTION FREQUENCY	1M FIXED DEPTH GRAB SAMPLE	HYDROBI OLOGICA L-RQS LAB PREP.	1000ML WHITE PLASTIC BOTT-BIOL

- An example of a monitoring schedule showing the sampling frequency.

4. PREPARATION AND CLEANING OF SAMPLE BOTTLES:

- ▶ Sample bottles must be 100% clean.



- ▶ Sample bottles are washed with special phosphate free cleaning agents.
- ▶ Do not use any bottles that were washed with ordinary dishwashing soap otherwise the results may not be valid.



IMPORTANT REMINDER

Small amounts of mercury chloride (preservative) leeches into the plastic of the container. It is very dangerous to carry any food or drink in these bottles as it will be contaminated with the toxic preservative

5. GENERAL CONSIDERATIONS REGARDING SAMPLING:

THIS MONITORING SCHEDULE IS EFFECTIVE FOR THE P

Monitor: DEPARTMENT OF WATER AFFAIRS AND FOF

Monitoring Point ID	Monitoring Point Name	Start & End Date	Action Frequency
90240	A2R001G01 HARTBESPOORT DAM ON CROCODILE RIV: NEAR DAM WALL	1999-02-01 2009-12-31	2 WEEK ACTIO FREQU Y



- ▶ Make sure that the sample is listed on the monitoring schedule

- ▶ Make sure that you have the correct sample bottles.



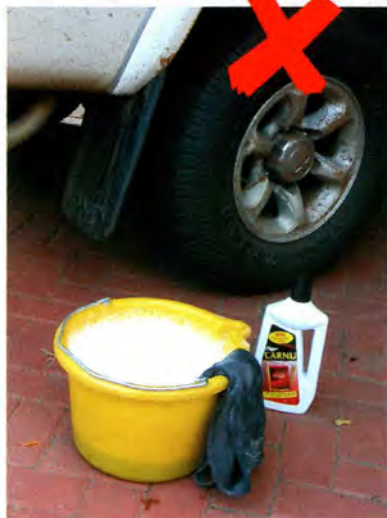
- ▶ Make sure that you have the correct tags at hand



- ▶ Do not store samples on the windowsill. Even preserved samples can deteriorate.



- ▶ Never sample from a tap unless you are instructed to do so



- ▶ Keep all your sampling equipment clean, do not use for anything else!



- ▶ Do not use sample bottles as storage jars or candle holders or ashtrays!

An aerial photograph of a river with a dark blue text box overlaid in the upper center. The river is a mix of light and dark green, with a dark, winding channel. The text box contains a title and a list of sampling methods.

6. HOW TO TAKE A SAMPLE:

- Macro sample
- Trace metal sample
- Turbidity sample
- Sampling from a boat
- Sampling from a dam wall
- Sampling in a river

The macro sample:

Leave the lid on the bottle until you are ready to take the sample.
Collect a little bit of water and rinse the bottle.
Pour the water out, away from where the sample will be taken.



Now collect the sample by lowering the bottle into the water.
Perform a forward scoop motion if the boat is not moving.



Do not fill the bottle right up to the top.
Leave space for the preservative.



Preserve the sample with one ampoule containing Mercury chloride.
Break ampoule and then drop both pieces into the bottle. (see page 21)



Fill out the correct tag as received from Resource Quality Services and fasten around the neck of the bottle with a piece of string.



Store sample in a cooler box or dark container



The trace metal sample:

Leave the lid on the bottle until you are ready to take the sample.
Collect a little bit of water and rinse the bottle.
Pour the water out, away from where the sample will be taken.



Now collect the sample by lowering the bottle into the water.
Perform a forward scoop motion if the boat is not moving.



Fill the bottle to the top.



DO NOT ADD PRESERVATIVE



Fill out the correct tag as received from Resource Quality Services and fasten around the neck of the bottle with a piece of string.



Store sample in a cooler box or dark container



The turbidity sample:

Leave the lid on the bottle until you are ready to take the sample.
Collect a little bit of water and rinse the bottle.
Pour the water out, away from where the sample will be taken.



Now collect the sample by lowering the bottle into the water.
Perform a forward scoop motion if the boat is not moving.



Fill the bottle to the top.



DO NOT ADD PRESERVATIVE



Fill out the correct tag as received from Resource Quality Services and fasten around the neck of the bottle with a piece of string.



Store sample in a cooler box or dark container



Sampling from a boat:



Collect the sample by lowering the bottle into the water, Perform a forward scoop motion if the boat is not moving.

or



Use a beaker to collect water and then pour into the sample bottle.



Never take a sample near the motor of a boat

**Sampling from
a dam wall:**



Use a clean bucket to collect water. Make sure not to scrape the bucket against the concrete wall when pulling it up.



Fill the sample bottles immediately



Do not sample at a point where lots of debris have accumulated

Sampling in a river:

The sample can be collected using any of the methods shown. Use the method that works best for your particular sampling site.



Never take a sample from a stagnant pool that is not connected to the main flowing river




Wear protective clothing (waders and gloves) when sampling in polluted water

7. TEMPERATURE MEASUREMENTS:

The Monitoring Schedule might request a water temperature reading. The procedure to take such a reading is as follows:

- Temperature should be measured directly in the water to be sampled
or
- when collecting water in a beaker, first fill your sample bottle and then read temperature from water left in the beaker
or
- measure the temperature in the water that is used to rinse the bottle

Record the reading on the Macro tag in the space for "remarks"

	POISONOUS
SAMPLING DATE/TIME:	Y Y Y Y M M D D H H M M
DEPTH SAMPLED:	END DEPTH:
FLOW:	YES NO IRRELEVANT
REMARKS:	21°C
MONITOR:	TEL No.:



8. HOW TO PRESERVE A MACRO SAMPLE:

Fill the sample bottle to approximately 1 cm below the neck of the bottle.



Take one ampoule containing preservative and lightly tap the bottom on a solid surface, or tap with your finger to allow all the liquid to run down to the wide part.



Hold the ampoule in one hand - use thumb and forefinger of the other hand to snap the top off.



The two halves of the ampoule are now dropped into the sample bottle.



Screw the cap on tightly and shake the bottle a couple of times.



Do not open the bottle again!



9. IMPORTANT WARNING:

The liquid in the ampoules is extremely poisonous and must be handled with care. Each ampoule contains 2mg of mercury (II)

Whole or broken ampoules, or their liquid contents, should under no circumstances be exposed to fire or heat

On contact with the skin: wash the area thoroughly with soap. If an ampoule breaks accidentally, the surrounding area should also be washed thoroughly with water.

If the liquid is swallowed, a doctor must be called at once
FIRST AID - Drink a mixture of one raw egg white and a glass of milk

Handle the ampoule as little as possible and do not allow contact with soil, fertiliser, soap etc

Keep the ampoules in their original containers
Keep out of reach of children



