

Water Sampling and Field Measurement

Jean Smith
EPA Laboratory
Kilkenny

Aims of Sampling

- **Quality**
- **Consistency**
- **Representative Sample**
- **Prevent Deterioration**
- **Prevent Contamination**
- **Reliable Results**

Aim of Sampling

**Quality, Consistency, Representative Sample,
Prevent Deterioration, Prevent Contamination**

- **Suitable Sampling Techniques**
- **Correct Sampling Bottles & Preservatives**
- **Accurate Field Measurements**
- **Transportation**
- **Time**





Sampling

Different water types require different sampling techniques

- Effluents – Industrial and Municipal
- Groundwater

Sampling Effluents

Wastewater samples may be either grab samples or composite samples.

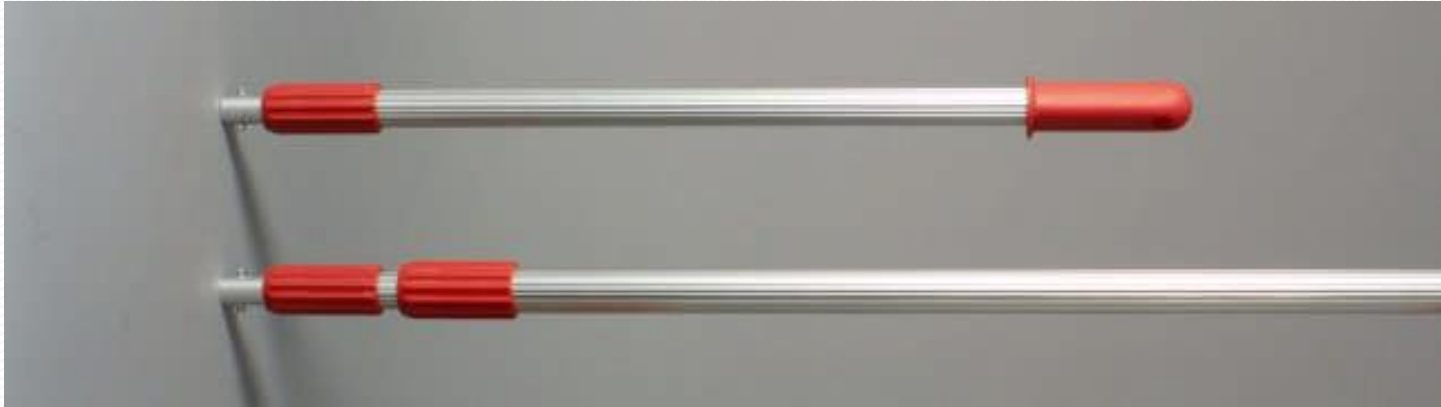
- Water samples are usually obtained by filling a container held beneath the surface of the water – commonly referred to as a dip or **Grab sample**.
- **Composite samples** are usually obtained by mixing equal volumes of discrete grab samples (collected at one point at regular time intervals. A composite sample provides an estimate of average water quality conditions.

Grab Sample

A sample taken at a specific time and point which gives an indication of the water quality at that point in time.



Other Grab Samplers



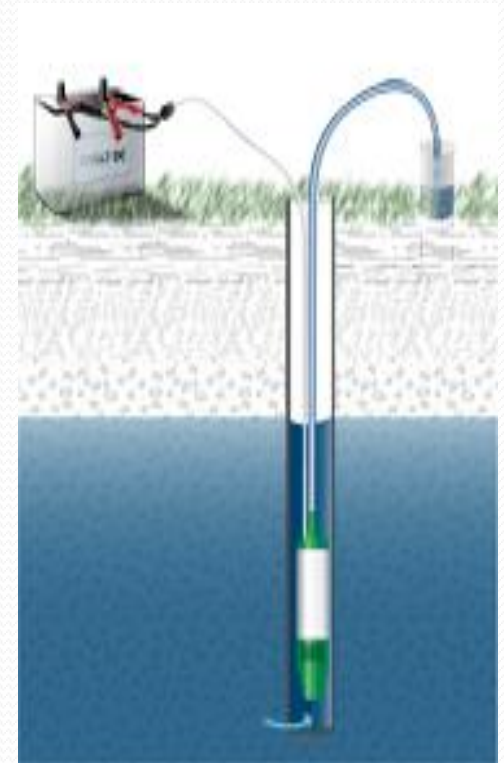
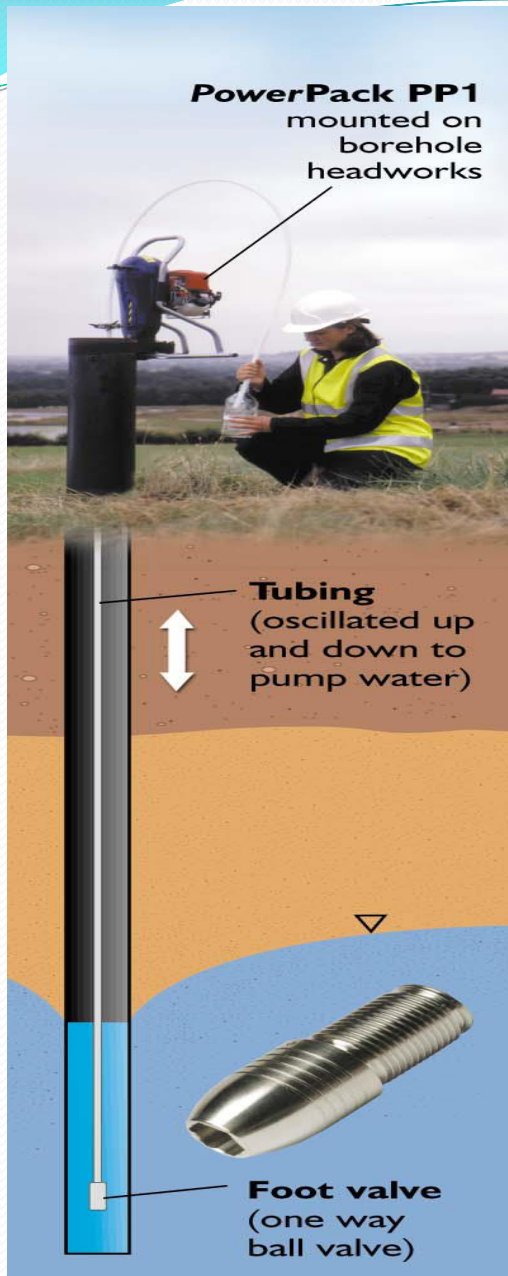
*Telescopic
sampling
system.*

Composite Sample

Various sample intervals and subsample volumes can be set



Groundwater Sampling



Groundwater Sampling



Sampling Bottles

- Preferable to use NEW bottles
- If not new then rigorous cleaning before re-use (rinse with detergent, twice with tap water, twice with DI water)
- Store in clean, dry, dust free environment before use
- Adequate for volume required
- Add preservatives – if required (label and expiry date)
- Check bottle types required with lab

	Sample Bottle Types used at the EPA Laboratory, Kilkenny		
	Analysis Type	Bottle Type and Volume	Remarks
A	General Analysis	1 or 2 litre plastic	Use new 1 or 2 litre plastic milk bottles.
B	Trace Metals	100 ml plastic	Add 0.5 ml of conc. HNO ₃ to the 100 ml sample
C	Volatile Organic Compounds - VOCs	40 ml glass screw-capped vials each equipped with a PTFE-faced rubber septum.	Supplied pre-cleaned and sealed. Do not agitate sample prior to sealing the bottle. Fill the bottle completely to exclude all air.
D	Semi Volatile Organic Compounds - Semi Volatiles	250ml amber glass bottles each equipped with a PTFE-faced rubber septum.	Supplied pre cleaned and sealed. Do not agitate sample prior to sealing the bottle. Fill the bottle to within 1 cm of the top.
E	Microbiological – For Drinking Water	500 ml plastic bottles – each containing 50 mg of sodium thiosulphate	Pre-sterilised – each bottle has a small red label that confirms exposure to radiation. Leave ≈ 2.5 cm air space to facilitate mixing before examination.
F	Microbiological – For non-Drinking Water	250 ml plastic (no sodium thiosulphate added)	Pre-sterilised. Leave ≈ 2.5 cm air space to facilitate mixing before examination.
G	Fat Oil & Grease	1 litre glass	Use a separate 1-litre glass bottle (e.g. a Kilner jar that has been pre-calibrated at 1 litre). Do not sub-divide samples; if duplicate analyses are required then use a separate container for each analysis.
H	Phenols	100 ml amber with 1 ml of 10% NaOH	Check with the lab re: preservatives prior to sampling - Preservative should be added in the laboratory prior to sampling.
J	Cyanide	100 ml plastic with 1 ml of 10% NaOH	Check with the lab re: preservatives prior to sampling - Preservative should be added in the laboratory prior to sampling.



Sampling Bottles



Taking a sample – Contamination

- the residue of earlier samples remaining on sampling containers
- contamination from the sampling site during sampling
- residual water in or on ropes, chains, handles
- contamination of funnels from preserved samples
- contamination of the barrel of syringes and from filter medium;

Taking a sample – Contamination

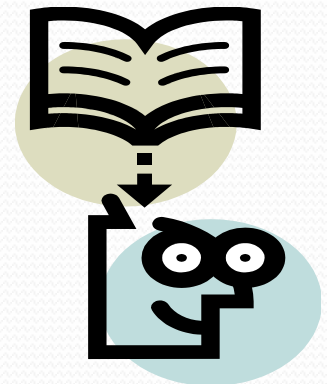
- from hands, fingers, gloves and general handling
- internal combustion exhaust
- inappropriate sampling devices, bottles and filtration devices
- degraded reagents.
- contamination of bottle caps or tops by dust or water

Avoiding Contamination

- maximizing the degree of isolation
- avoid disturbance at the sampling site
- thoroughly rinse the equipment
- rinse funnels inside and out after sub-sampling preserved samples
- rinsing the barrel of the syringe and filter medium
- storing bottle caps and tops securely
- Wipe & dry ropes, chains handles between sampling & prior to storage
- avoid touching the sample with fingers, hands or gloves very imp. during microbiology sampling where no contact should be made with the interior or rim of the bottle or the cap

Field Sheets

- Reminder of where and what need to sampled/measured
- Permanent record of sample details
- Record of field measurements
- Observations
- Deviations



Field Sheets

- **Sampling location (name and/or code)**
- **Sampling date and time**
- **Name & signature of sample collector**
- **Results of field measurements e.g. Temp, DO, pH**
- **Types of samples taken (general chemical, metals, VOC's etc.)**
- **Details of any preservative used/ filtration carried out**
- **GPS readings – if new location or non-routine site**
- **Observations – weather, visual inspection**
- **Deviations**

Chain of Custody

Covers the transfer or handover of samples from field staff to the Laboratory (or via courier)

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Field Sheet and Chain of Custody sheet for Environmental Samples		Sheet 1 of 1

1. Origin of Samples

Samples from: _____

Sampling Date: _____ Sampled by: _____
(Signature of Sampler)

LABORATORY NO.*				
BOTTLE MARKING				
SAMPLE LOCATION AND DESCRIPTION				
SAMPLING TIME				
COMMENTS				
TEMPERATURE °C DO % SATN.				

2. Courier (This section to be completed where the courier and sampler are different persons)

The samples as described above were passed from the sampler to the courier
at _____ hours on ____/____/____.

Signed: _____
(Sampler) (Courier)

3. Receiving Laboratory

Received at: _____ Laboratory

at _____ hours on ____/____/____.

Signed: _____
(Sampler or Courier) (For Receiving Laboratory)

THE ORIGINAL OF THIS SHEET IS TO BE RETAINED IN THE SAMPLING LABORATORY. USE THE BACK OF THIS SHEET FOR ADDITIONAL COMMENTS, SKETCHED ETC. *THE LABORATORY NUMBER IS TO BE ASSIGNED ON RECEIPT AT THE SAMPLING LABORATORY.

Field Measurements

e.g. Temperature, pH, Dissolved Oxygen (DO), Conductivity

- **Calibration of Equipment**
- **Measure on a sub-sample**

Equipment Calibration

- **Thermometers – annual check**
- **Manufacturers *User Manual***
- **Calibrate DO, pH, on daily or before use basis.**
- **Full pH check should be done weekly**
- **Conductivity/Salinity checked on daily/before use basis (Std. @ 20°C)**
- **Use a QC check standard on daily or before use basis**
- **Record data on Calibration Sheet or Field Sheet**

Temperature

- **Alcohol-filled thermometer (usually used for effluents)**
- **Electronic thermometer**

Most multimeters contain temperature probes

- **Measure temperatures directly in the water**
- **Allow thermometer to equilibrate**

pH

Negative logarithm of the hydrogen ion concentration of an aqueous solution

$$pH = -\log_{10}[H^+]$$

- **Buffering Capacity of water**
- **Temperature dependant**
- **Extremes can effect palatability, corrosive effects, ammonia toxicity, metal solubility etc.**

Conductivity

Conductivity is a measure of the ability of an aqueous solution to carry an electrical current



QA/QC for Sampling

Estimate the Degree of Error due to Sampling, Preservation, Transportation

- Replicate Samples
- Field Blanks
- Spiked Samples

Transportation

- Containers should be protected and sealed to prevent loss of constituents
- Packaging material should protect the containers
- During transportation, the samples should be stored correctly

References

- **ISO 5667, International Standards Organisation (ISO), Standards for water and Sediment Sampling - 19 parts**
- ***Standard Methods for the Examination of Water and Waste Water, 21st Edition, A.P.H.A., A.W.W.A., W.E.F., 2005.***