Information note on monitoring of private water supplies

Background

Monitoring provides crucial information necessary to determine the status of a supply at a moment in time – the time the sample was taken.

Monitoring is used to identify supplies that do not meet water quality standards and for the evaluation or verification of control measures introduced to supply systems to ensure compliance.

The requirements for the monitoring of the Private Water Supplies (Wales) Regulations 2010 are found in Schedule 2 and Schedule 2A of the Regulations and are explained further below. Local authorities must monitor all private water supplies according to the supply type (regulation 8, 9 or 10 supply).

Regulation 8 supplies

For those supplies categorised as regulation 8 supplies, the monitoring must be carried out on the basis of the risk assessment – see Information Note on Regulation 8.

Regulation 9 supplies

The local authority must carry out check monitoring and audit monitoring (in accordance with Schedule 2) and carry out any additional monitoring that the risk assessment shows to be necessary. For further details, see information note on Regulation 9.

Regulation 9 requires local authorities to carry out check monitoring and audit monitoring at specified frequencies according to the volume of drinking water being consumed for domestic purposes. It is therefore necessary to know the daily average volume of water used for human consumption only for each supply. Where this is unknown the local authority should estimate the volume by multiplying the number of people supplied by an assumed water consumption of $0.2m^3$/day (200 litres per day) – see Table 4: Estimating volumes using population.

Water fountains

When a private water supply supplies a single drinking water fountain and no other premises, the local authority is required to monitor the supply at the fountain in accordance with Regulation 9. When the private water supply supplies a drinking water fountain and other premises, the local authority should select a representative premises for sampling from all those supplied including the fountain. However, as the fountain represents the highest risk, it should be sampled at least once per year and, when it is sampled, the local authority should take a sample at the same time for microbiological parameters only (coliforms, *E.coli* and colony counts) from one of the other premises supplied by the supply.

a) Check monitoring of Regulation 9 supplies:

The purpose of check monitoring is to establish levels of specified microbiological, chemical and organoleptic parameters for determining compliance with drinking water quality standards and the effectiveness of existing control measures and those introduced following risk assessment are working satisfactorily.

The specified check monitoring parameters are shown in Table 1. Some parameters are mandatory, whereas others need only to be monitored if the circumstances specified in the table exist.

Table 1: Circumstances for check monitoring for specified parameters

Circumstances	Parameters
When used as flocculant or where the water originates from, or is influenced by, surface waters	Aluminium Iron Manganese *Clostridium perfringens* (including spores)
In all supplies	Ammonium Coliform bacteria Colony counts Colour Conductivity *Escherichia coli* (*E.coli*) Hydrogen ion concentration (pH) Taste Turbidity*
When chloramination is practised**	Nitrite Nitrate
Only in the case of water in bottles or containers***	*Pseudomonas aeruginosa*

* Turbidity must be monitored at consumers' taps against a standard of 4NTU and in the water leaving treatment works (where there is one) against an indicator parameter value of 1NTU where the source is surface water or groundwater influenced by surface water.

** The Regulations do not require residual chlorine disinfectant to be monitored but it is strongly recommended that local authorities monitor this at the check monitoring frequency. The same applies for the monitoring of any other approved chemical disinfection process where chlorite and chlorate must be controlled, for example. Note that there is no residual disinfectant where water is disinfected using irradiation with ultraviolet (UV) light. Hence the importance of ensuring a validated unit is used.

*** Where the water is offered for free. If it is for sale, then it will be covered by the Natural Mineral Water, Spring Water and Bottled Drinking Water (Wales) Regulations 2015.

Table 2: Check monitoring frequency

Volume supplied (m^3/day)	Check monitoring frequency (Number of samples per year)	Volume supplied (m^3/day)	Check monitoring frequency (Number of samples per year)
≤ 10	1	> 5,000 ≤ 6,000	22
> 10 ≤ 100	2	> 6,000 ≤ 7,000	25
> 100 ≤ 1,000	4	> 7,000 ≤ 8,000	28
> 1,000 ≤ 2,000	10	> 8,000 ≤ 9,000	31
> 2,000 ≤ 3,000	13	> 9,000 ≤ 10,000	34
> 3,000 ≤ 4,000	16	11,000*	37 [4 + (3 x 11)]
> 4,000 ≤ 5,000	19	12,000*	40 [4 + (3 x 12)]
		* For volumes greater than 10,000 the formula 4 + (3 x n) is used to calculate check monitoring frequency:	4 + (3 x n) Where n = the number of 1,000m^3/day rounded up to the nearest multiple of 1,000m^3/day.

The Regulations allow a local authority to reduce the frequency of check monitoring by up to 50% of the specified frequency for particular parameters if specified conditions exist. These conditions are:

- the local authority is of the opinion that the quality of water in the supply is unlikely to deteriorate;
- in the case of the hydrogen ion, the pH value is not less than 6.5 and not more than 9.5; and
- in all other cases, in each of two successive years, the results of samples taken for the purposes of monitoring the parameter in question are stable and significantly lower than the concentrations or values laid down in Schedule 1.

For supplies of 10m^3/day and less a reduction in the annual frequency of one sample per year is not permitted. For supplies of 10m^3/day to 100m^3/day or less, it is recommended that local authorities do not apply reduced frequencies because these supplies are already monitored infrequently. Local authorities should regard ‘significantly lower’ as below 60% of the concentration or value specified in Schedule 1 to the Regulations.

Each local authority is required to carry out a risk assessment of each private water supply. A local authority may increase the frequency of check monitoring for a particular parameter if it considers it appropriate from the results of the risk assessment, for example, because the risk assessment shows that the concentration or value of the parameter is likely to vary considerably. A local authority may include any other parameter or any other substance in check monitoring if it considers it appropriate from the results of the risk assessment. For example, arsenic may be included in the monitoring suite if the natural geology indicates that it may be present.

b) Audit monitoring of Regulation 9 supplies:

The purpose of audit monitoring is for determining compliance with drinking water quality standards listed in Schedule 1 (except where those parameters have already been included in check monitoring) and, if disinfection is used, to check that disinfection byproducts are kept as low as possible without compromising the disinfection.

The local authority may exclude parameters from audit monitoring where it can demonstrate that the parameter in question is unlikely to be present in the supply at a concentration or value that poses a risk of the private supply failing to meet the concentration, value or state specified in Schedule 1 in respect of that parameter; and the risk assessment confirms that there is no factor that can reasonably be anticipated which is likely to cause that parameter to increase. In the absence of information to be taken into account during the risk assessment, local authorities may refer to the previous three years of data (analysed by a laboratory accredited by UKAS for that parameter) taken at the audit monitoring frequency. These samples would ideally have been taken regularly, i.e. throughout the year where more than one sample per year is required, and at different times of the year where one per year has been taken. They should be representative of the whole supply, i.e. taken from a consumer's tap where there is no individual point of use treatment which is not available to all other properties on the supply. If a parameter does not exceed 60% of the standard in any of the samples then the parameter may be excluded in up to 50% of the audit samples. If a parameter does not exceed 30% of the standard in any sample, then they may be removed from the audit monitoring suite. The risk assessment should be kept under continuous review and audit monitoring parameters reintroduced should it indicate a parameter is likely to fail.

There are certain parameters which are controlled through the use of approved products under Regulation 5, and for which monitoring is therefore not informative. Where products containing these parameters are not part of the supply system, then there is no need to monitor for these parameters. Unapproved products identified in the supply system during risk assessment may require monitoring for parameters otherwise controlled through Regulation 5 and the product approval process – see Regulation 5 Information Note.

Audit monitoring frequency

Table 3: Audit monitoring frequencies

Volume supplied (m^3/day)	Audit monitoring frequency (number of samples per year)	
≤ 10	1	
> 10 - ≤ 3,300	2	
> 3,300 - ≤ 6,600	3	
> 6,600 - ≤ 10,000	4	
20,000*	5 [3 + (1 x 2)]	* For volumes greater than 10,000 the formula 3 + (1 x n) is used to calculate audit monitoring frequency: 3 + (1 x n) Where n = the number of 10,000m^3/day rounded up to the nearest multiple of 10,000m^3/day.
30,000*	6 [3 + (1 x 3)]	
> 10,000 - ≤ 100,000*	3 + 1 for each 10,000m^3/day of the total volume (rounding up to the nearest multiple of 10,000m^3/day)	
125,000**	15 [10 + (1 x 5)]	** For volumes greater than 100,000 the formula 10 + (1 x n) is used to calculate audit monitoring frequency: 10 + (1 x n) Where n = the number of 25,000m^3/day rounded up to the nearest multiple of 25,000m^3/day.
> 100,000**	10 + 1 for each 25,000m^3/day of the total volume (rounding up to the nearest multiple of 25,000m^3/day)	

Regulation 10 supplies

Excluding single dwellings not used for a commercial activity, the local authority must monitor other private water supplies (Regulation 10 supplies – see information note 10) for five specified parameters and any other parameters whether listed in Schedule 1 or not. Additional parameters need only be monitored where a risk assessment has determined a risk of not complying with prescribed water quality standard or where there is a potential danger to human health. For this type of supply the minimum monitoring frequency is at least once every five years unless the local authority's risk assessment justifies increasing the frequency. The five specified parameters are; conductivity; Enterococci; *Escherichia coli* (*E.coli*); hydrogen ion concentration; and turbidity.

Monitoring of supplies used only for toilet flushing

A private water supply to a premises used only for toilet flushing falls under the definition of domestic purposes under the Water Industry Act 1991 (section 218). However, a risk assessment for the supply should be carried out to determine any health risks associated with that use, or if there are any aesthetic issues which may affect its acceptability. If the risk assessment confirms that there are no significant risks to health, routine monitoring is not required.

Inclusion of additional parameters

For each type of supply the regulations permit the monitoring of any parameter, whether listed in the regulations or not where a local authority considers it appropriate from the results of the risk assessment. For example, it could include silver, if silver or silver compounds are incorporated in any filtration system used to treat private water supplies (the World Health Organisation (WHO) guidelines suggest that silver levels up to 0.1mg/l can be tolerated without risk to human health) or zinc if galvanised pipework has been used in distribution or domestic plumbing (the WHO guidelines suggest that zinc levels over 3.0mg/l may be regarded as unacceptable by consumers). Likewise, chloride may indicate some types of groundwater contamination (saline intrusion).

Where *Cryptosporidium* is deemed a risk as identified by the risk assessment, the presence or absence of oocysts on any particular sampling occasion will not be informative. Therefore the only time that testing is relevant is an outbreak or confirmed cases of cryptosporidiosis are being investigated.

Unacceptable taste and odours often arise because the drinking water source itself may have become contaminated following historical industrial contamination, or there has been a fuel, heating oil or solvent spill affecting the supply system. Hydrocarbon-related ground contamination is particularly problematic where plastic pipes have been laid, since these chemicals can migrate through the plastic water pipes and contaminate the supply. Where this has occurred, the solution is normally to replace the contaminated pipes with barrier piping.

Fuels and solvents are complex mixtures of chemicals with extremely low taste and odour thresholds meaning that they are detectable in the water at concentrations well below those of concern for health, hence it is not appropriate to set a health-based standard. Because of this, if a fuel taste or odour is detected it is not necessary to undertake extensive testing and analysis for exotic organic compounds – the water will be unwholesome by virtue of the taste and odour present in it.

Indicator parameters

Detection of indicator parameters above the specification or value require an investigation to determine the cause. The appropriate action is determined by the cause. For some parameters which are found to be naturally occurring Public Health Wales can advise whether it is safe to use at the level found. If the cause is contamination the source of the contamination should be determined and mitigated.

Repeat testing

Where a sample exceeds a standard for a particular parameter(s), the local authority must carry out an investigation under Regulation 15 of the Private Water Supplies (Wales) Regulations 2010. Additional repeat testing will be required to help determine the cause and extent of the failure, as part of the investigation (i.e. a risk-based site inspection). Local authorities should not rely on repeat sampling alone to determine whether a supply is wholesome and/or a potential danger to health or not. Local authorities are not permitted to charge for any sample taken and analysed solely to confirm or clarify the results of the analysis of a previous sample.

Once the cause has been established the local authority must serve a Notice in accordance with regulation 16 or 18, as required to mitigate the risks identified by the investigation.

Table 4: Estimating volumes using population

Volume supplied (m^3/day)	Number of people supplied	Check monitoring frequency (number of samples per year)
≤ 10	≤ 50	1
> 10 ≤ 100	> 50 ≤ 500	2
> 100 ≤ 1,000	> 500 ≤ 5,000	4
> 1,000 ≤ 2,000	> 5,000 ≤ 10,000	10
> 2,000 ≤ 3,000	> 10,000 ≤ 15,000	13
> 3,000 ≤ 4,000	> 15,000 ≤ 20,000	16
> 4,000 ≤ 5,000	> 20,000 ≤ 25,000	19
> 5,000 ≤ 6,000	> 25,000 ≤ 30,000	22
> 6,000 ≤ 7,000	> 30,000 ≤ 35,000	25
> 7,000 ≤ 8,000	> 35,000 ≤ 40,000	28
> 8,000 ≤ 9,000	> 40,000 ≤ 45,000	31
> 9,000 ≤ 10,000	> 45,000 ≤ 50,000	34
> 10,000	> 50,000	4 + 3 for each 1,000m^3/day of the total volume (rounding up to the nearest multiple of 1,000m^3/day)*

Any water used for rearing livestock or irrigation can be excluded from the total volume of water used.

* Worked example:

For volumes greater than 10,000m^3/day the formula 4 + (3 x n) is used to calculate check monitoring frequency:

For example:

A volume of 10,162m^3/day is rounded up to 11,000m^3/day and then using the formula 4 + (3 x n) where n = the number of 1,000m^3/day rounded up to the nearest multiple of 1,000m^3/day.

$$4 + \left(3\, x\, \frac{11{,}000}{1000}\right)$$

$$4 + (3\, x\, 11)$$

$$4 + (33)$$

37 samples per year. These should be taken at regular intervals throughout the year.

Table 5: Likely causes of a parameter arising in a private water supply

Parameter	Circumstances in which likely to be present
Aluminium	Where aluminium compounds are used as coagulants in treatment. Occurs naturally in some surface and groundwaters.
Antimony	It can be derived from domestic plumbing fittings.
Arsenic	It can be present naturally in some groundwaters.
Benzene	Contamination of raw waters from petrol/diesel etc. Permeation of plastic distribution and domestic plumbing pipes.
Benzo(a)pyrene	Leaching from internal coal tar lining of some distribution pipes.
Boron	Contamination of surface waters with detergents mainly from sewage effluents.
Bromate	Present in sodium hypochlorite used to disinfect water, including electrolytically generated hypochlorite. Formed if ozone used and water contains bromide. Can occasionally be found as contamination from industrial activities.
Cadmium	Leaching from galvanised pipes and some domestic plumbing fittings (e.g. plated taps).
Chloride	Indicator of saline intrusion, so relevant in coastal areas. Also relevant if water softener installed. May indicate sewage pollution of surface water.
Chromium	Leaching from some domestic plumbing fittings (e.g. chrome-plated plastic taps). Can also occur as contamination from industrial activities.
Clostridium perfringens (including spores)	Contamination of raw waters from sewage, sewage effluents and animal waste.
Copper	Leaching from pipes and plumbing fittings. Low pH and low or high alkalinity increases copper leaching.
Cyanide	Possible contamination of raw waters from industry (e.g. metal finishing, wood preservatives).
1,2 dichloroethane	Volatile solvent used in manufacture of vinyl chloride and other processes. Can contaminate and persist in groundwater.
Enterococci	Contamination of raw waters from sewage, sewage effluents and animal waste.
Fluoride	May be present in some groundwaters.
Iron	Use of iron compounds as coagulants. Occurs naturally in some surface water and groundwaters. Corrosion of iron distribution pipes.
Lead	Leaching from lead pipes in distribution and domestic plumbing or from lead soldered copper pipes. Low pH and low or high alkalinity increases lead leaching. Present naturally in some groundwaters.

Parameter	Circumstances in which likely to be present
Manganese	Present in some greensand filtration materials. Occurs in some surface water and groundwaters.
Mercury	Contamination from mercury thermometers and float valves.
Nickel	Leaching from some domestic plumbing fittings (e.g. plated taps).
Nitrate	Contamination of surface and groundwaters from fertilisers, animal wastes or sewage effluents.
Nitrite	Contamination of raw waters. Use of chloramination as a residual disinfectant or use of chlorine as disinfectant when ammonium ions present.
Pesticides	Contamination of raw waters from use in agriculture, forestry, roads, railways etc.
Pesticides – total	This means the sum of the concentrations of the individual pesticides detected and quantified in the monitoring procedure.
Polycyclic aromatic hydrocarbons (PAH)	Leaching from internal coal tar lining of some distribution pipes. Sum of four individual PAH.
Selenium	May occur naturally in some raw waters.
Sodium	Present in raw waters but usually below standard. Can be introduced by water softeners and treatment chemicals (e.g. sodium hypochlorite for disinfection) or through saline intrusion of groundwaters in coastal areas.
Sulphate	Occurs in some raw waters, but usually below the standard.
Tetrachloroethene and Trichloroethene	Contamination of some groundwaters from use of these volatile solvents in dry cleaning and metal finishing. Standard is sum of two compounds.
Tetrachloromethane	Contamination of some groundwaters from use of this volatile solvent in metal finishing and other industries.
Trihalomethanes – total	Formed by reaction of organic matter in raw water with chlorine compounds used as disinfectants. Standard is sum of four compounds.
Radioactive substances	
Radon	May be present in groundwaters where the underlying geology contains elevated levels of radon (see information note 10A).
Total indicative dose (for radioactivity)	Contamination of raw waters from natural or manmade radioactive compounds (see information note 10A).
Tritium	Cosmic production in upper atmosphere. Byproduct of nuclear explosions and nuclear industry (see information note 10A).
Acrylamide	Use of polyacrylamides as coagulant aids. Use of polyacrylamide grouts for borehole/well linings.
Epichlorohydrin	Use of polyamines as coagulant aids. Use of epoxy resins (e.g. to line pipes and tanks). Use to make some ion exchange resins.
Vinyl chloride	Used for making PVC. Leaching from unplasticised PVC pipes used in distribution or domestic plumbing.