GUIDANCE ON THE IMPLEMENTATION OF THE WATER SUPPLY (WATER QUALITY) REGULATIONS 2010 (as amended) IN WALES

DRAFT for CONSULTATION – APRIL 2016
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SECTION A - INTRODUCTION

A1. Purpose of this document

1.1. This document provides guidance on the implementation of:

- the Water Supply (Water Quality) Regulations 2010 (S.I. 2010/994 (W.99))
- and the Water Supply (Water Quality) (Amendment) Regulations 2016 (S.I. 2016/410 (W.128))

which apply to water undertakers¹ and combined licensees whose areas of supply are wholly or mainly in Wales. The Inspectorate publishes a parallel guidance document relating to the Water Supply (Water Quality) Regulations 2016 (S.I. XXXX) which apply to water undertakers and combined licensees whose areas of supply are wholly or mainly in England. In line with common practice, water undertakers, inset appointees and combined licensees are referred to as water companies throughout this Guidance document, and the requirements apply to all, unless stated otherwise.

1.2. The Drinking Water Inspectorate (DWI) exercises the powers and duties of the Welsh Ministers in Wales, therefore references to DWI or “the Inspectorate” in this document mean on behalf of the Welsh Ministers.

1.3. This Guidance document replaces previous versions of the Guidance on the 2010 Regulations. It does not purport to offer an authoritative interpretation of the Regulations. We recognise that it may contain omissions and that some of the advice contained may need to be modified or updated in light of experience gained with implementing the Regulations or as and when further guidance on interpretation of the Drinking Water Directive is published by the European Commission.

1.4. From time to time the Inspectorate issues updated guidance to companies through publication of Information Letters and guidance notes, therefore water companies should always check the DWI website for Information Letters and other guidance issued after this guidance document. This Guidance is consistent with advice issued by DWI Information Letters up to and including 01/2016.

1.5. For the purposes of consulting with water companies, this draft guidance is in the form of one document covering all of the Regulations. The final Guidance will be published in sections, and will be updated as necessary. This will reduce the future need for Information Letters, since the Guidance will be continually updated.

1.6. Companies are welcome to comment on all aspects of the Guidance. The master copy of this document has been placed on the Drinking Water Inspectorate website (http://www.dwi.gov.uk) and only that version will be updated, as and when necessary. It is the intention to review the Guidance on a regular basis as the need arises. Water companies will be notified of any changes to the Guidance by e-mail.

¹ For the purposes of this guidance document “Undertakers” includes Inset Appointees.
A2. The regulatory framework in Wales

2.1 The following legal instruments and associated documents provide the regulatory framework for the quality of drinking water supplies in Wales. Copies of all these documents are available on the Inspectorate's website.


ii. **The Water Industry Act 1991** (the Act) – the primary legislation which enables regulations to be made and contains the duties of water companies and the powers used by the Inspectorate.


iv. **The Water Act 2014** – introduced a number of changes to water companies’ licences to prepare for market reform (the provisions applying mainly in England) and changes to the abstraction licensing process. It imposes a primary duty on the economic regulator (Ofwat) to secure resilience in the water sector. Section 40 of this Act introduces the provision for the Inspectorate to charge fees for the exercise of its functions.

v. **Council Directive 2013/51/Euratom of 22 October 2013** - sets out the requirements for the protection of public health with regard to radioactive substances in drinking water, including monitoring requirements.

vi. **Drinking Water Quality Regulations** applying in Wales:

     These regulations consolidate all amendments to the previous Water Supply (Water Quality) Regulations and apply only to companies based wholly or mainly in Wales.

   - **The Water Supply (Water Quality) (Amendment) Regulations 2016** (S.I. 2016/410 (W.128))
     The purpose of the 2016 amendment Regulations is to transpose the requirements of Council Directive 2013/51/Euratom of 22 October 2013 (referred to throughout as the Euratom Directive) into the Welsh drinking water quality Regulations. In particular, a standard for radon in drinking water and associated radioactivity monitoring requirements are introduced.
2.2 Other legal instruments applying to Wales:

i. **The Water Industry (Suppliers' Information) Direction 2012** – made under provisions in the Act. Specifies the format and timing of water companies’ provision of information to the Inspectorate.


iii. **The General Food Regulations 2004** (SI 2004 / 3279 as amended) and **Council Regulation 178/2002**.

iv. **Council Directive 98/34/EC The Technical Standards and Regulations Directive** - requires member states to notify all new technical regulations when they are at the draft stage.

v. **Security and Emergency Measures (Water and Sewerage Undertakers) Direction 1998**


vii. **The Water Supply (Water Fittings) Regulations 1999** (SI 1999 / 1148) – set out requirements for water fittings and pipework installed or used in premises receiving a public water supply from a water company, to prevent contamination, waste, misuse and undue consumption. Compliance with the Water Fittings Regulations is enforced by water undertakers, under section 74 of the Act.

2.3 There are a wide range of other useful documents on the science and practice of drinking water quality regulation from research reports through to industry best practice documents. All of these may be of assistance to water companies. The Inspectorate makes many of these available through its website (http://www.dwi.gov.uk) either directly or by links to other websites. Examples include:


iii. The Government’s response to the consultation on the amendment of the Water Supply (Water Quality Regulations) 2016 (the English Regulations) held between 1 February 2016 and 14 March 2016. This document updates Government’s policy on drinking water quality.


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2 To be updated
v. The Standing Committee of Analysts (SCA) Blue Book methods – for analysis of chemical and microbiological parameters, sampling procedures and other relevant methods.

vi. BS ISO 5667 Series – Water Quality Sampling – covers various aspects of water quality sampling methods and techniques. There are also BS_ISO standard methods available for microbiological and chemical analysis of water.


ix. DWI 70/2/301 Understanding the implication of the EC’s proposals relating to Radon in drinking water for the UK

x. The List of Approved Products for Use in Public Water Supply in the United Kingdom – this is updated regularly throughout the year by the Inspectorate.
SECTION B - THE REGULATIONS

In this section, the main paragraph reference numbers relate directly to the relevant regulation number.

PART I - GENERAL

B1. Regulation 1 - Citation, commencement and application

1.3 The Regulations apply to water companies based wholly, or mainly in Wales, including areas supplied by those companies that are in England. They also apply to inset appointments operating and supplying water in Wales, and to combined licensees operating and supplying water in Wales.
1.4 The Regulations do not apply to companies based wholly or mainly in England, and do not apply to areas supplied by those companies that are in Wales. Water companies based solely or mainly in England, inset appointments and combined licensees operating supplies in England are governed by the Water Supply (Water Quality) Regulations 2016 (the English Regulations).

B2. Regulation 2 - Interpretation

2.1 Regulation 2 lists definitions of some of the terms used in the Regulations.
2.2 Definition of a service reservoir. Since the previous Guidance was published in 2010, the Inspectorate has provided updated guidance to companies on the definition of a service reservoir:

2.2.1 Regulation 2(3) specifies the definition of a service reservoir, which, for the purposes of these Regulations, is any structure in the public supply network that is used for storage of treated water prior to onward supply to consumers, either directly, or via further service reservoir(s) and/or booster pumping station(s).

2.2.2 The definition categorically excludes tanks used for storage of treated water which are situated on water treatment works sites.

2.2.3 The definition includes temporary structures such as static tanks or tankers that are connected to the distribution system and are being used for storage of treated water prior to onward supply to consumers.

2.2.4 In 2015 the Inspectorate carried out a technical audit of break pressure tanks and other small tanks connected to distribution systems. The findings indicated that, in most circumstances, break pressure tanks provide some storage, and consequently fall within the definition of a service reservoir. Therefore, except where the company can demonstrate that the residence time of the water retained is effectively zero, break pressure tanks and other tanks connected to the system, irrespective of size, should be classified as service reservoirs and sampled in accordance with the requirements of regulation 14.
PART II - WATER SUPPLY ZONES

B3. Regulation 3 - Delineation and designation of water supply zones

3.1 Regulation 3(1) requires water companies to pre-designate the names and areas of the supply zones within its supply area for the forthcoming calendar year. Regulation 3(2) specifies that the water supply zone should not supply more than 100,000 people. Regulation 3(3) requires that the water within a supply zone should be approximately uniform and regulation 3(4) requires that the designation of a water supply zone should not change through the year.

3.2 In the last quarter of each calendar year, water companies should review the designation of their water supply zones to ensure that the delineation remains appropriate and assess revised population estimates. The population estimates for water supply zones should relate to permanent residents only. During the review, water companies should identify any water supply zone where the estimated resident population supplied exceeds 100,000, and split or merge the zone accordingly. It is best practice to keep the number of changes to the designation of water supply zones to a minimum.

3.3 Regulation 3(3) requires a consistent approach in the delineation of water supply zones. Water companies should therefore first identify which areas are supplied from a single point of supply. A point of supply could be the outlet of a water treatment works, a pumping station, a blending point, a service reservoir or a meter point on a bulk supply of treated water provided by another water company. A discrete area supplied from a single point of supply should always be recorded as a single water supply zone unless it supplies more than 100,000 people, in which case the area should be subdivided.

3.4 The Inspectorate recognises that actual supply arrangements can be more complicated and the following points are intended to assist in the interpretation of the requirement of regulation 3(3):
   i. Where each supply zone is served by an individual service reservoir or water tower, booster pumping station or distinguished as a discrete pressure zone or by other appropriate features of the distribution system;
   ii. Where there is more than one source of water that is of a similar nature and receives the same treatment;
   iii. Where water supply zones are based on district metered areas and the zones consist of related district metered areas which are supplied from common points of supply.

3.5 Water supply zones should be designated according to operational factors, following this guidance. Companies should not follow arbitrary principles or designate zones with a view to influencing performance statistics.

3.6 It is recognised that water companies sometimes have to take temporary operational actions to maintain water supplies that may involve the introduction of water from points of supply not designated for that supply zone. Such temporary measures should not influence the annual designation of water supply zones. If permanent changes have to be made to the sources that supply a zone, or to the delineation of that zone, the designation of the zone can only be changed for the next calendar year.
3.7 Concessionary (free) supplies of water for domestic purposes, for example supplies to a single property or a small number of co-located properties in a rural area, that exist as a consequence of an historic agreement with a landowner, are fully subject to the requirements of these Regulations. Supplies that have similar characteristics (for example surface waters, or springs with minimal treatment) should be grouped together in a single separate water supply zone. Since privatisation in 1989, water companies have been phasing out concessionary supplies that have point of use treatment units. The Inspectorate supports this and considers this approach to be best practice since these types of supply generally expose consumers to greater risks of receiving unwholesome water.

3.8 Where the designation of zones is changed prior to the start of a calendar year, companies must specify and keep a record of the relationship between the previous zone designations and the new ones. This information is needed to ensure continuity with regulation 29 risk assessment reports and where there are legal instruments and regulation 6A(3) radioactivity Notices in place.
PART III – WHOLESOMENESS

B4. Regulation 4 – Wholesomeness

4.1 Under section 68 of the Water Industry Act 1991 water companies have a statutory duty to supply wholesome water.

4.2 Water supplies provided for cooking, drinking, food preparation, washing and to premises where it is used for food production must meet the wholesomeness requirements of these Regulations regardless of whether the water is supplied from the public piped supply system, tanker, bottle or other container.

4.3 Under regulation 4, water is deemed to be wholesome if it contains concentrations or values in respect of various properties, elements, organisms and substances that do not contravene the prescribed maximum, and in some cases, prescribed minimum, concentrations or value (PCV), as set out in Schedule 1, parts I and II, of the Regulations. Most of the PCVs are listed in Tables A and B in Schedule 1. Part I of this Schedule refers to parameters that are set out in the Directive, and Part II refers to national requirements, which currently apply across the UK.

4.4 Regulation 4(2) requires that water supplied for regulation 4(1) purposes must not contain any micro-organism, parasite or substances at a level which could be a potential danger to human health, including where no standard has been set. From time to time the Inspectorate publishes on its website research reports and guidance on new and emerging drinking water safety issues, which companies should familiarise themselves with. Companies should also take into consideration expert opinion on drinking water safety such as that published in the World Health Organisation (WHO) Guidelines for Drinking-water quality and independent medical advice from Public Health England or Public Health Wales.

4.5 Regulation 4(2)(d) specifies the nitrate/nitrite formula that must be satisfied where nitrate and nitrite are present together at concentrations that, individually, may comply with their respective PCVs.

4.6 Regulation 4(3) specifies the point at which wholesomeness must be established. Compliance with regulation 4 applies at consumers’ taps, and, in the case of water supplied from tankers, bottles and other containers, the point at which it emerges from the container:

i. **Consumer’s tap:** This is any tap in any part of a premises where the water is used, or has a reasonable expectation of use, for human consumption, including drinking, washing, cooking and food preparation. In a domestic property this tap is normally the kitchen cold water tap. In non-domestic properties the sampler should identify a suitable tap that is normally used for drinking and food preparation (or supply to the public in the case of public buildings – see regulation 21) and sample from that tap. Where more than one suitable tap is available in a building, the sampler should record accurately which tap was sampled, to aid compliance with regulations 18 and 19.

ii. **Tankers:** In the context of regulation 4, tankers are bowsers and static tanks. The point of compliance is defined as the point at which water first emerges from the tank.

iii. **Bottles and containers:** The point of compliance for bottles and containers is defined as the point at which water first emerges from any bottle or container. This relates only to bottles or containers which have been stored by the water
company at a temporary local public distribution point. It does not relate to
stocks of bottles or containers which are under the control and management of
the producer, the company or any specialist supplier.

4.7 Regulation 4(4) defines the criteria for wholesomeness on transfer from water
treatment works.

4.8 Regulations 4(5) and 4(6) define the criteria for wholesomeness on transfer from
service reservoirs. Regulation 4(6) allows up to 5% of samples taken in any calendar
year that a reservoir is in use to contain coliform bacteria, however regulation 4(5)
requires that any occurrence of coliform bacteria in a sample taken from a service
reservoir should be thoroughly investigated to establish the cause, so that steps can
be taken to prevent a deterioration in quality and to mitigate the risk of unwholesome
water being supplied to consumers.

4.9 Risk assessments carried out under the requirements of Regulation 28 should cover
all risks to wholesomeness, from substances and organisms which have parametric
standards, and from those which do not.

4.10 Refer also to the guidance on regulation 16 covering sampling procedures, and
regulation 10 which requires monitoring for substances other than parameters that
may result in water being unwholesome.

4.11 Regulation 4 does not make any reference to Indicator Parameters, listed in Schedule
2 of the Regulations and which have specified concentrations or values. If an indicator
parameter fails its specified value, water companies are required to investigate the
cause and take any remedial action necessary to ensure that the water supply is not,
and becomes, unwholesome. See also under regulation 19.

PART IV – MONITORING OF WATER SUPPLIES

B5. Regulation 5 – Interpretation and Application of Part 4

5.1 Regulation 5 sets out the difference between audit monitoring and check monitoring.

5.2 Audit monitoring is the mandatory monitoring required to enable companies to
demonstrate that water supplies comply with regulation 4 – wholesomeness, and
comply with the standards specified in Schedules 1 and 2 of the Regulations, which
cover the Directive’s requirements, national requirements and indicator parameters.

5.3 The purpose of check monitoring is twofold:

i. to ensure parameters that give an indication of the effectiveness of treatment (in
particular disinfection) and the acceptability of water to consumers (for example
taste, odour and discolouration parameters) are monitored at an appropriate
frequency and

ii. To ensure that indicator parameters comply with the specifications set out in
Schedule 2 of the Regulations.

5.4 Check monitoring for aluminium and iron is required where these metals may be
present in the water by virtue of the coagulant chemical used in the water treatment
process.
5.5 Check monitoring for iron and aluminium is also required, along with manganese and *Clostridium perfringens*, if the water supply is derived from surface water, or is influenced by surface water.

5.6 Regulation 5(4) specifies that regulations 5 to 9 apply where a combined licensee introduces water into an undertaker’s supply system. The undertaker receiving a combined licensee’s supply retains responsibility for carrying out the monitoring of its own supply system. If the point at which the combined licensee’s supply enters the undertaker’s system is designated as a supply point for monitoring purposes, the undertaker is responsible for carrying out that monitoring. In these circumstances the combined licensee and the undertaker are jointly responsible for managing any risks to quality and sufficiency, and should have documented agreements in place covering management of drinking water quality, sufficiency and emergencies. Regulation 10 also applies to combined licensees, and combined licensees are responsible for monitoring any consumers’ premises supplied directly which are not within an undertaker’s supply system, and also their own treated waters (regulation 13) and service reservoir outlets (regulation 14) – see under later sections.

**B6. Regulation 6 – Monitoring: general provisions and Regulation 6A – Monitoring: radioactive substances**

6.1 Regulation 6 specifies that the minimum number of samples water companies must take in each of their water supply zones for compliance purposes must be in accordance with Schedule 3 of the Regulations.

6.2 It is recognised that water companies take additional samples for operational purposes that are over and above those taken to demonstrate compliance with the Regulations. Water companies may carry out sampling for both compliance and operational purposes on the same sampling occasion provided that the samples taken are identified by separate unique sample numbers or other auditable process (with the appropriate sample reason).

6.3 Companies may take more compliance samples than the minimum specified, but it is not good practice to programme significantly above the numbers specified for selected parameters in order to influence compliance statistics.

6.4 Parameters for which check monitoring is required are listed in Table 1 of Schedule 3. As explained in 5.4 and 5.5 above, some of the parameters have conditions specified. If the conditions for those parameters are met then check monitoring must be carried out for that parameter. Otherwise the audit monitoring frequency applies.

6.5 Other parameters listed in Table 1 which do not have conditions specified must be monitored at the annual check monitoring frequency (depending on population of the supply zone) as specified in Table 2 of Schedule 3.

6.6 Minimum annual sampling frequencies for audit monitoring, where check monitoring is not a requirement, are also given in Table 2 of Schedule 3. Parameters included in check monitoring do not need additional audit samples, because the check monitoring frequencies specified cover both purposes.

6.7 **Regulation 6(6) – Monitoring for copper, lead and nickel**: Sampling is required at consumers’ taps for copper, lead and nickel at the audit frequency specified in Table 2 of Schedule 3. The sampling point should be selected from the random consumer tap (supply zone) sampling programme and the sample should be the first one litre of water drawn from the tap without flushing.
6.8 Monitoring for Pesticides

6.8.1 Pesticides and related products are defined as any organic insecticide, herbicide, fungicide, nematocide, acaricide, algicide, rodenticide, slimicide, molluscicide and any product related to any of these including any growth regulator, and their relevant metabolites, degradation and reaction products. “Relevant” should be taken to mean any metabolites, degradation and reaction products that have similar pesticidal properties to their parent pesticides.

6.8.2 The standard for pesticides applies to each individual pesticide, excluding aldrin, dieldrin, heptachlor and heptachlor epoxide which each have their own standard of 0.03 µg/l. The Total Pesticides parameter relates to the sum of all detected concentrations of the individual pesticides (including aldrin, dieldrin, heptachlor and heptachlor epoxide) and any relevant metabolites, degradation and reaction products detected and quantified in the samples taken on a particular sampling occasion from a sampling point. This definition recognises that more than one sample may be taken on a particular sampling occasion from a sampling point to enable all the pesticides of interest to be determined.

6.8.3 It is not practical or necessary to monitor for compliance purposes every pesticide that is used within the catchment of a water source. Water companies should develop pesticide monitoring strategies based on risk, and include pesticides likely to be detected as a result of their properties and usage in the raw water catchment for any given treatment works. On the basis of that strategy, the treated water leaving each treatment works should be monitored at the frequency specified in Table 3 of Schedule 3 of the Regulations. The treatment works sampling point should be designated as the supply point for the zones supplied.

6.8.4 The majority of pesticide monitoring should take place in the raw water to inform companies’ risk assessments and to assess the need for treated water pesticide monitoring.

6.8.5 Companies should monitor treated drinking water for any pesticide which is identified as a residual inadequately controlled risk, for example where there is no treatment capable of removing the pesticide. Where there is treatment such as granular activated carbon (GAC) in place to remove pesticides, or blending is in place to achieve compliance, then the treated or blended water monitoring should include individual pesticides that are likely to be present in the raw water in concentrations greater than 0.1 µg/l.

6.8.6 Companies should keep their monitoring strategies for pesticides under continual review, particularly for any new and emerging pesticides and related products, and ensure that they are current and relevant. The European Chemicals Agency website (http://echa.europa.eu/) maintains a current list of registered biocidal products.

6.9 Regulation 6, paragraphs 3 and 4 – monitoring water supplied from tankers

6.9.1 Regulation 6 paragraphs 3 and 4 specify the requirements for monitoring water supplied from tankers (transportable bowsers and static tanks) where they are used during emergencies to provide an alternative to the piped public supply. Water from every individual tank or bowser must be sampled 48 hours after the start of its use for *E. coli* and conductivity; and every 48 hours thereafter for these two and all other Schedule 1 parameters. Only wholesome water should be used to fill bowsers. It is good practice for companies to keep records of bowsers and
tanks deployed, the time filled and the time taken out of use, in order to be able to
demonstrate compliance with these regulations.

6.9.2 Guidance on cleaning and disinfecting bowsers before use, and maintaining
wholesomeness whilst in use, is given in The Principles of Water Supply Hygiene
published by Water UK (October 2015). Manufacturers’ instructions for use should
also be consulted.

6.9.3 These regulations do not apply to vehicle tankers when used to introduce drinking
water into the distribution network either directly or to fill service reservoirs. In
these circumstances companies should follow manufacturers’ instructions for use
and guidance in The Principles of Water Supply Hygiene when cleaning and
preparing tankers, and for maintaining wholesomeness of the water during
transport and discharge into the public supply system. Tankers used to supply
drinking water must not be used for any other purpose. Monitoring of reservoir
outlets should remain as specified in regulation 14, and it is best practice to carry
out additional operational monitoring of water supplied from the reservoirs, and
water as it is discharged from tankers, to confirm that the water supplied is
wholesome.

6.9.4 Where tankers are used to inject water directly into the distribution network, it is
considered to be best practice to sample water as it is discharged, as a minimum
for microbiological parameters and turbidity, and also from suitable points
downstream in the network to verify that flow changes and disturbance of deposits
have not caused a deterioration in quality.

6.10 Regulation 6A, paragraphs 1 to 8 – radioactive parameters:

General provisions

6.10.1 Regulation 6A, paragraphs 1 to 8 and Schedule 3A of the amendment
Regulations cover the monitoring requirements for the Schedule 2 (indicator)
radioactivity parameters Indicative Dose (ID), radon and tritium (radioactivity
monitoring).

6.10.2 Radioactivity monitoring should be initially informed by companies’ catchment risk
assessments, taking into account the geology and any artificial sources that could
lead to an increase in natural background levels of radioactivity. There are a
variety of reference sources available to facilitate this, but the most
comprehensive source of monitoring data is a joint publication issued annually by
the Environment Agency (EA), the Food Standards Agency (FSA), the Scottish
Environment Protection Agency (SEPA) and the Northern Ireland Environment
Agency (NIEA) called the Radioactivity in Food and the Environment (RIFE)
report, available on the FSA website. Additional information can be found in the
EA’s Radionuclides Handbook and the DWI-commissioned report on radon (DWI 70/2/301 Understanding the implication
of the EC’s proposals relating to Radon in drinking water for the UK). A table of
common radioactive isotopes and their sources is included in Appendix 2 –
Radioactivity Monitoring.

6.10.3 If radioactivity has not been detected in a water supply source, and the catchment
risk assessment confirms that it is unlikely to be detected, then monitoring for ID,
tritium and radon is not required. This is allowed under regulations 6A(3) and
6A(4) – see paragraph 6.10.9 below for further guidance.

6.10.4 The Inspectorate considers that it is best practice to monitor radioactivity at
treatment works, on the basis that levels should not deteriorate (i.e. become
worse) in distribution. For the purposes of reporting data to the Inspectorate, each
treatment works sampling point should be designated as the supply point for the
zones it supplies. The zones supplied should also be recorded in applications for
Notices issued under regulation 6A(4).

6.10.5 In the event of an exceedance of the specified value for any of the radioactivity
parameters, The UK Recovery Handbooks for Radiation Incidents 2015, Drinking
be followed for the investigation.

**Indicative Dose**

6.10.6 **Indicative Dose (ID)** has a specified value of 0.1mSv. Schedule 5 of the 2016
amendment Regulations covers additional monitoring requirements and analytical
performance characteristics for Indicative Dose:

6.10.6.1 Monitoring for ID is not required if it is unlikely to exceed 0.1mSv, regardless
of the source of the radioactivity. ID is normally monitored by proxy through
measurement of gross alpha and gross beta activity. Gross alpha activity has a
maximum limit, known as a screening value, of 0.1Bq/l, whilst gross beta
activity has a maximum screening value of 1.0Bq/l.

6.10.6.2 Where there is no historic data to confirm ID, or where there is no regulation
6A(3) Notice in place (see under 6.10.9 below), monitoring for gross alpha and
gross beta activity must be carried out, at the treatment works at the audit
monitoring frequency specified in Table 3 of the Regulations. The treatment
works must be designated as a supply point for the zones supplied. The ID
should be reassessed at appropriate intervals, based on risk. If the radioactivity
is naturally derived, and the levels of gross alpha and gross beta activity are
reasonably stable, then a minimum interval of 5 years is suggested as best
practice.

6.10.6.3 If it can be demonstrated that detections of gross alpha and/or gross beta
activities are attributable to a specific radionuclide, the water company  may
monitor for this radionuclide instead, at the treatment works at the audit
monitoring frequency specified in Table 3 of Schedule 3.

6.10.6.4 Some low energy emitters, for example carbon (\(^{14}\text{C}\)), sulphur (\(^{35}\text{S}\)) and
plutonium (\(^{241}\text{Pu}\)) will not be detected by screening for gross beta activity. A risk
assessment is therefore critical to determine whether there are any likely
sources of radioactivity that may not be detected through routine screening.
Monitoring for individual radionuclides should therefore be conducted, based
on risk assessment.

6.10.6.5 If the level of radioactivity appears to be increasing and/or new information
becomes available which indicates that the risk is increasing, ID should be
reassessed.

6.10.6.6 If gross alpha and/or gross beta activity is detected above its screening value,
and/or risk assessment indicates that ID could exceed 0.1mSv, audit
monitoring must be carried out. Following an initial exceedance of a screening
level, further investigational samples should be collected every few days, at
least once per week, for a minimum period of one month, to confirm the level of
activity.

6.10.6.7 Gross alpha and gross beta activity (with regard to the point made in 6.10.6.4
above) should then be monitored at the appropriate audit monitoring frequency
for the supply point. ID should be determined in accordance with Schedule 5 of the Regulations, based on the derived concentrations (previously known as reference levels) given for the radionuclides listed. Companies should use all relevant information about likely sources of radioactivity when deciding which radionuclides to monitor.

6.10.6.8 If the calculated ID exceeds 0.1mSv, or if the concentration of any radionuclide detected is greater than 20% of the derived concentration, then further monitoring for radionuclides should be undertaken to confirm the ID.

6.10.6.9 If at any time the ID is found to exceed 0.1mSv, then this should be reported to the Inspectorate as an event, as required by regulation 35(6), and the source of the radioactivity identified. If action is required to protect public health, the Inspectorate may decide to issue a regulation 20(4) Notice.

6.10.6.10 If the source of the radioactivity is suspected to be an artificial source, then companies should monitor initially, as a minimum, all the radionuclides listed in Schedule 5, and any others based on risk assessment. ID should then be calculated.

6.10.6.11 Schedule 5 paragraph 7 includes a provision for Welsh Ministers to set alternative screening values for gross alpha activity and gross beta activity where it can be demonstrated that the alternative values are in compliance with an ID of 0.1mSv. Further guidance will be provided to companies about this at a future date.

**Radon**

6.10.7 **Radon** has a specified value of 100Bq/l:

6.10.7.1 Schedule 3A paragraph 1 requires that water companies must carry out a representative survey to determine the likelihood of radon exceeding the specified value. The report referred to in paragraph 6.10.2 above, *DWI 70/2/301 Understanding the implication of the EC’s proposals relating to Radon in drinking water for the UK* is the report on a national representative survey undertaken to fulfil this requirement. In this report, areas of England and Wales have been mapped and delineated based on whether the geology, existing sample result data and radon-in-air hazards are indicative of a high, moderate or low risk of radon being present as a drinking water quality hazard.

6.10.7.2 Companies should use the data provided in this report to inform their catchment risk assessments. Guidance on monitoring requirements is given in Information Letter 05/2015 *Publication of Research: Understanding the Implications of the European Requirements relating to Radon in Drinking Water*, summarised in 6.10.7.3 below:

6.10.7.3 Companies should complete a risk assessment for every source catchment and determine an appropriate monitoring strategy for radon, based on the risk of radon being present in treated water, as follows:

i. Surface waters do not require monitoring for radon.

ii. Groundwaters in low hazard areas do not require monitoring for radon.

iii. Groundwater supplies in high and moderate hazard areas should, from 1st January 2016, be monitored at the treatment works, at the audit frequency specified Schedule 3, Table 3 until the end of 2016; after which a further review should be carried out to assess whether any further regulatory
monitoring is required. Under regulation 6A(3), see under 6.9.9 below, companies may then apply to the Inspectorate for a Notice granting an exemption from monitoring, supported with appropriate evidence.

6.10.7.4 Companies should carry out catchment risk assessments to confirm that sources geographically located in the low hazard areas identified in the report referred to above (in 6.10.7.1) are not at risk of exceeding the specified value for radon. Companies wishing to extend beyond 2016 the exemption from monitoring for surface supplies and groundwaters identified as low risk, should apply to the Inspectorate for a regulation 6A(3) Notice, accompanied with documentary evidence of risk assessment.

6.10.7.5 The specified value for radon of 100Bq/l applies at consumers’ taps. Available evidence indicates it is unlikely that any public supplies will exceed this level, even where radon activity exceeds 100Bq/l at the treatment works, because radon gas is readily released into the atmosphere. In the event of an exceedance of the specified value for radon, further investigational samples should be collected from the treatment works every few days, at least once per week, for a minimum period of one month, to confirm the level of activity.

6.10.7.6 If radon is detected at greater than 100Bq/l in water supplied from a treatment works, investigational monitoring should also be undertaken at consumers’ taps to assess the impact on public health. Properties in high risk areas may be at risk of elevated levels of atmospheric radon, which could be exacerbated by radon present in the tap water. Advice should be sought from Public Health Wales or Public Health England if there is any concern.

6.10.7.7 In the event of an exceedance of the specified value for radon, further investigational samples should be collected every few days, at least once per week, for a minimum period of one month, to confirm the level of activity.

6.10.7.8 The Regulations specify an upper maximum limit for radon of 1,000Bq/l. If this level is exceeded, remedial action is required without consideration. It must be reported immediately to the Inspectorate as an event, as required by regulation 35(6). Companies should also consider, as a matter of best practice, reporting any detections of radon at levels exceeding 100Bq/l to the Inspectorate as an event, because this will allow the Inspectorate to be involved with discussions about any actions required to protect public health, which will add to the overall knowledge base for radon in drinking water supplies and inform future guidance published by the Inspectorate.

Tritium

6.10.8 Tritium has a specified value of 100Bq/l:

6.10.8.1 Monitoring for tritium must be carried out where there is an anthropogenic (man-made) source of tritium in the catchment and the data indicates that the level of radioactivity due to tritium exceeds, or is likely to exceed, the specified value. Monitoring should be carried out at the treatment works, at the audit monitoring frequency specified in Table 3 of Schedule 3. The treatment works must be designated as a supply point for the zones supplied.

6.10.8.2 Where tritium is detected above 100Bq/l and it can be demonstrated that the source is naturally-derived, then a regulation 6A(3) Notice may be applied for. This situation is unlikely to arise, however, since the presence of tritium in water would invariably be associated with an artificial, or anthropogenic, source.
6.10.8.3 If the level of tritium activity detected exceeds 100Bq/l, then companies should carry out further investigations to identify the source, and undertake monitoring for additional anthropogenic radionuclides. Further investigational samples should be collected every few days, at least once per week, for a minimum period of one month, to confirm the level of activity.

6.10.8.4 If at any time tritium is found to exceed 100Bq/l, then this should be reported to the Inspectorate as an event, as required by regulation 35(6). If action is required to protect public health, the Inspectorate may decide to issue a regulation 20(4) Notice.

Regulation 6A(3) to 6A(7) – Exemptions from Monitoring and Reduced Monitoring

6.10.9 Regulations 6A(3) to (6) cover allowable exemptions from monitoring and reduced monitoring for radioactivity parameters.

6.10.9.1 Under regulation 6A(3) the Inspectorate may issue Notices to water companies granting exemption from undertaking monitoring for ID, radon and/or tritium. Companies should provide evidence from their catchment risk assessments and monitoring data (whether compliance or operational monitoring) to support any application for a Notice. In each case the evidence must demonstrate that water supplied from the treatment works is not likely to exceed the relevant specified value in Schedule 2 of the Regulations. The Inspectorate will determine the period of the exemption.

6.10.9.2 Regulation 6A(7) allows the Inspectorate to permit a reduced frequency for radioactivity monitoring, where it can be demonstrated that the source of the radioactivity is naturally occurring, and the levels are stable. Applications for reduced monitoring will be approved through the issue of Notices. The Inspectorate will determine the period covered by the Notice.

6.10.9.3 Regulation 6A(5) requires the Inspectorate to communicate to the European Commission (EC) the grounds for authorising any exemption from monitoring granted under regulation 6A(3), and provide the EC with all the documentary evidence used to support the authorisation. Regulation 6A(6) covers the circumstances where the Inspectorate must revoke a regulation 6A(3) Notice, and water companies’ duties to reinstate monitoring for the relevant parameter.

6.10.9.4 If, through companies’ radioactivity monitoring, any isotopes of uranium are detected, the company should analyse samples for uranium concentration (as µg/l) to ensure that the concentrations of uranium found do not present a risk to wholesomeness by virtue of the element’s chemical toxicity. The WHO guideline value (GV) for uranium is 30µg/l. If uranium is detected at a concentration exceeding the GV, then it should be reported to the Inspectorate as an event, as required by regulation 35(6). Public Health Wales should be consulted to determine whether any action is needed to protect human health.

6.10.9.5 Further guidance on radioactivity sampling and analysis is given in Appendix 2: Radioactivity Sampling and Analysis. The Appendix includes a flow chart to aid investigation of radioactivity, a table of commonly-found radioactive isotopes and their sources, information and reference sources for analytical methods and some guidance on the importance of understanding decay pathways.
B7. Regulation 7 – Sampling points

7.1 Regulation 7 requires all sampling points in water supply zones to be selected at random. Water companies are expected to maintain a sampling programme that selects sample points at random from a comprehensive list of all its consumers, including commercial premises and buildings where the water supply is made available to members of the public. Sampling points must be representative of the water supply zone as a whole.

B8. Regulation 8 – Authorisation of supply points

8.1 Regulation 8 permits the use of monitoring at designated supply points, in place of monitoring in water supply zones, for certain parameters (known as conservative parameters) provided it can be demonstrated that there is no material difference in the data for the parameter between the supply point and the consumers' taps in the zone. Under regulation 8(2) the Inspectorate automatically authorises the use of designated supply points for the parameters numbered 7 to 15 and 17 to 24 in Table 3 of Schedule 3 of the Regulations. Table 3 specifies the annual sampling frequency required for each parameter.

8.2 Nitrite is listed in Table 3 because audit monitoring of nitrite is required at treatment works (under Regulation 13(1)(c)). If chloramination is practised then the check monitoring frequency applies, at the works. If chloramination is not practised then the audit monitoring frequency applies at the works. It is not classed as a conservative parameter, and therefore monitoring at consumers' taps is also required (as specified in Table 2 of Schedule 3).

8.3 A supply point can be a treatment works outlet, a service reservoir outlet or a blending point, and may supply more than one zone. Treatment works and service reservoir sampling points used as supply points must be coded as supply points in companies' monthly data returns for the applicable parameters and zones supplied.

8.4 Under regulation 8(4) the Inspectorate has discretion to authorise supply points for other parameters, subject to certain criteria:

i. Antimony, arsenic, cadmium and selenium may be monitored at supply points where the water company can demonstrate for the zones supplied that these metals have not been detected at significant concentrations in samples taken from consumers' taps for at least two years.

ii. Trihalomethanes may be monitored at supply points where the water supply zones are supplied with water that originates solely from groundwater and the water company can demonstrate that the concentrations at consumers' taps have been an average (mean) of 30 µg/l or less for at least two years and not exceeded 50 µg/l in that time.

iii. Where a supply point authorisation is granted for any of the above parameters, companies should adopt the same audit sampling frequency as specified for other parameters listed in Table 3 of Schedule 3.

iv. Regulation 8(5) specifies that the granting of an authorisation under regulation 8(4) requires a written application from the water company. Regulations 8(6) to 8(10)
require that companies must inform the Inspectorate as soon as they become aware that use of a supply point is no longer appropriate for a parameter granted authorisation under regulation 8(4), and the Inspectorate will revoke the authorisation. Furthermore, the Inspectorate has a duty to revoke a Regulation 8(4) authorisation as soon as it becomes apparent, whether the company has informed the Inspectorate or not, that the authorisation is no longer appropriate.

8.5 Fluoride is one of the parameters that may be monitored at a supply point. Where supplies are artificially fluoridated at the request of the local authority, to achieve a target concentration in water supplied to consumers, fluoride should not be monitored at a supply point if the downstream fluoride concentration is likely to decrease through blending with water containing a lower concentration of fluoride. This would constitute "adverse change", as specified in the Directive’s criteria for use of supply points.

8.6 As explained previously in paragraph 6.8.3, it is best practice that pesticides are, as far as practicable, monitored at treatment works outlets. Where this is carried out the treatment works sampling point should be designated as a supply point for the zones supplied, and all pesticide monitoring undertaken at the supply point. The same applies to radioactivity parameters.

8.7 Clostridium perfringens is the only microbiological parameter which may be monitored at supply points. Check monitoring is required for C.perfringens in surface water supplies and supplies influenced by surface water. The primary reason for monitoring for C.perfringens is because of this organism’s properties as an indicator of remote or historic faecal contamination, and its usefulness as an indicator of the effectiveness of treatment processes, in particular processes designed to remove particles. Monitoring of C.perfringens at consumers' taps is not consistent with this primary role, therefore companies are advised not to routinely include this parameter in water supply zone compliance monitoring.

8.8 The specified check sampling frequency for C.perfringens required for large treatment works can be as high as 2,190 samples per year, which would necessitate taking multiple samples each day from large works. The Inspectorate considers that this is neither practical nor desirable and, therefore, where the required sampling frequency exceeds 365 samples per year it is best practice to take at least 365 samples from the treatment works, and take the remaining samples to meet the minimum frequency from other supply points such as service reservoir outlets. Where no practical alternative exists, the additional samples should be taken in water supply zones.

8.9 In respect of the following parameters, it is unlikely that authorisation to sample from supply points will be given because the results may differ in a material respect:

i. E.coli, coliform bacteria and colony counts, because these are likely to change in concentration through the distribution system;

ii. Lead, copper, nickel and chromium because these metals can be present from contact of the water with plumbing materials;

iii. Iron, manganese and aluminium because these metals can be present in water leaving treatment works and picked up from deposits in the distribution system;

iv. polycyclic aromatic hydrocarbons and benzo(a)pyrene because these substances are associated with coal tar pitch linings in distribution systems;

v. Colour, taste, odour and turbidity because these characteristics of the water supply can be affected by the condition of the distribution system and consumers’ plumbing systems;
vi. Hydrogen ion (pH) because this can change as the water passes through the distribution system and by treatment equipment within consumers' premises;

vii. Sodium because this can increase when sodium hypochlorite is added during distribution and when treatment equipment is used within consumers' premises;

viii. Ammonium and nitrite because these concentrations are likely to change as the water passes through the distribution system due to microbiological reactions and when chloramination is practised;

ix. Nitrate because it should be sampled at the same time and place as nitrite in order to calculate the nitrate / nitrite formula; and

x. Trihalomethanes when the water supply originates from or is influenced by surface water because the concentrations leaving the treatment works are likely to vary significantly as the water passes through the distribution system.

8.10 Regulation 8(3) prohibits the use of supply points where a combined licensee introduces water into the supply zone unless the water quality within the supply zone remains approximately uniform.

8.11 The Regulations make no reference to the provision of a bulk supply of water from one water company to another, though this is common practice. For the parameters specified, and subject to the Inspectorate’s approval, companies receiving a bulk import may use data gathered by the supplying company from its supply point in place of supply zone data, provided that the zone receiving the bulk import receives water only from the supplier’s supply point.

B9. Regulation 9 – Numbers of samples

9.1 Regulation 9 requires companies to take the standard number of samples from its water supply zones (consumers’ taps) or, where appropriate, supply points, for analysis for the parameters listed in Tables 2 and 3 of Schedule 3. As explained previously in paragraph 6.6, parameters included in check monitoring do not need additional audit samples, because the specified check monitoring frequencies cover both purposes.

9.2 Sampling frequencies for zones are based on the resident population of the zone, and for supply points the daily volume of water supplied, in cubic metres per day (written as m³/day).

9.3 Paragraph 2 of regulation 9 allows a reduced sampling frequency for parameters subject to check monitoring. The specified minimum reduced frequencies for water supply zones are shown in column 3 of Table 2, and for supply points in column 4 of Table 3.

9.4 Regulation 9(3)(a) requires that reduced frequency may only be adopted where the water company can demonstrate that the quality of water in relation to that parameter is not likely to deteriorate. The risk assessments carried out under the requirements of regulation 28 should form the basis for making this judgement.

9.5 Regulation 9(3)(b) specifies a second condition, which is that previous results for the parameter over the preceding two years demonstrate that the normal concentration is significantly lower than the PCV or specification for indicator parameters, and that there has been no significant variation in the concentration. For hydrogen ion concentration (pH) the results must all be within the range of 6.5 to 9.5, and results for
colony counts (heterotrophic plate counts at 22°C and 37°C) should show no abnormal change.

9.6 The Inspectorate accepts the following criteria as evidence that reduced frequency may be applied. In each case the sampling data set should be regulatory compliance samples reported to the Inspectorate over the two years prior to the commencement of reduced sampling. If, during that two-year period, fewer than 12 samples have been taken, then results from the last 12 compliance samples should be used:

9.6.1 For aluminium, ammonium, colour, conductivity, iron, manganese, nitrate, nitrite and turbidity: The arithmetic mean must be no more than 20% of the PCV or specified value; and, no result in the same data set should exceed 50% of the PCV or specified value.

9.6.2 For taste and odour all the results must be less than a dilution number of 1, and there has been no significant increase in the number of consumer complaints in the water supply zone.

9.6.3 For Clostridium perfringens, the organism has not been detected in any of the samples.

9.6.4 For colony counts, all the results obtained are within plus or minus one order of magnitude of the mean for that zone. In cases where the mean value is less than 2/ml, individual results up to 20/ml can be taken as indicating no significant variation and no abnormal change.

9.6.5 For the hydrogen ion parameter, all the results for pH are within a spread of 1 pH unit, and all the results in the same data set are within the range 6.5 to 9.5.

9.6.6 For all parameters, there must be no risk requiring additional controls identified in the company’s risk assessment or outstanding corrective actions (e.g. arising from events) for the supply system that could cause the parameter to exceed the PCV or specified value.

9.7 Where reduced frequency is in place, companies must revert to standard frequency immediately on a pro rata basis for the remainder of that year and the two following calendar years, once it is established that any of the above conditions are no longer applicable, and inform the Inspectorate accordingly.

9.8 Regulation 9(4) requires that samples are taken at regular intervals throughout the year. Companies should ensure that they have sufficient sampling manpower resource and analytical capability to ensure that this requirement is complied with throughout the year. Clustering of samples to compensate for an earlier shortfall, incurred for example during a period of high workload, or staff holidays, constitutes a failure to comply with this regulation.

9.9 If a supply point has been operational for part of a year, the number of samples taken (whether at reduced or standard frequency) should be in the same proportion as the number of days in the year (midnight to midnight) that the supply point was in use.

9.10 If a water company fails to take or analyse a prescheduled compliance sample, for example because of a broken sample bottle or analytical quality control (AQC) breach, it should reschedule a further sample as soon as possible, to be taken well in advance of the next programmed sample, as far as is practicable. Since the Regulations require the frequencies to be met on an annual basis rescheduling does not constitute a
shortfall. Provided the resampling is prompt, occasional occurrences of this type will not be regarded as a failure to meet the regularity requirement.

B10. Regulation 10 – Sampling: further provisions

10.1 Regulation 10 requires companies to take samples for any element, organism or substance that may cause the water to be unwholesome, where there are reasonable grounds to do so. For example the company's risk assessment has identified that a treated water is at risk of being unwholesome because of the presence of Cryptosporidium, which is not a parameter. The company must take a sufficient number of samples, at an appropriate frequency, in order to assess and quantify the risk, and to determine any necessary remedial actions required to ensure that the water supply is wholesome at all times. This should take into account any expected seasonal variation.

PART V – MONITORING ADDITIONAL PROVISIONS

B11/12. Regulations 11 and 12– Interpretation of Part 5 & Sampling for particular substances and parameters

11.1 Part 5 of the Regulations set out the sampling requirements for water treatment works and service reservoirs, which are additional to the requirements for monitoring in water supply zones covered by Part 4. Regulations 11 and 12 introduce the requirements, and confirm that combined licensees are responsible for monitoring their own treatment works and service reservoirs.

B13. Regulation 13 - Sampling at treatment works

13.1 Regulation 13(1) requires water companies to take samples for E.coli, coliform bacteria, colony counts, nitrite, residual disinfectant and turbidity (numbered 1 to 6 in Table 3 of Schedule of Schedule 3) at the required flow-related frequency from the point at which water leaves each treatment works. Where chloramination is not practised, the frequency for nitrite should be that specified against item 16 (audit monitoring) rather than against item 4.

13.2 Regulations 13(2) and (3) provide for a reduced sampling frequency for all these parameters, with the following conditions: For coliform bacteria and E.coli, no positive samples taken during the previous two years; and for turbidity, no result exceeding 1 NTU during the previous two years. The Inspectorate accepts the following criteria as evidence that reduced frequency is appropriate for colony counts:

13.2.1 Reduced frequency may be applied when there has been no significant increase in the counts in each of two successive years. Colony counts, particularly for surface water derived supplies, are likely to vary seasonally because of changes in quality and temperature. A significant increase should be regarded as a count
which is more than one order of magnitude greater than that normally expected for the time of year the sample was taken for the works in question.

13.3 Regulation 13(4) specifies additional conditions for coliform bacteria and *E. coli*, such that there must be no foreseeable risk that coliform bacteria or *E. coli* could be present in the water leaving the treatment works and that there must be secure fail-safe arrangements in place to prevent undisinfected water from entering supply in the event that the disinfection process fails or is compromised. This means that the treatment works must be designed and operated to comply fully with the requirements of regulation 27, with preliminary treatment processes and disinfection stages appropriate for the type and quality of the raw water supplying the works, and microbiological catchment risks.

13.4 The Inspectorate would not approve the application of reduced frequency to only one of the coliform bacteria or *E. coli* parameters.

13.5 Where reduced frequency is in place for any of the above, companies must revert to standard frequency immediately on a pro rata basis for the remainder of that year and the two following calendar years as a minimum, once it is established that any of the above conditions is no longer applicable, and inform the Inspectorate accordingly.

13.6 Regulation 13(5) specifies that samples must be taken at regular intervals (refer to guidance given in paragraph 9.8 above).

13.7 Sampling frequencies should be based on the average daily output from the works during the previous year except where it is known that the current sampling year’s average daily output will be significantly different.

13.8 Where there is more than one outlet at a treatment works requiring separate sampling points, the sampling frequency should be determined separately for each sampling point based on the average daily output at each point.

13.9 If a treatment works has been operational for part of a year, the number of samples taken (whether at reduced or standard frequency) should be in the same proportion as the number of days (midnight to midnight) in the year that the works was in use.

13.10 Where a contact main or clean water tank situated on a works site is used to calculate the Ct value for that works, the final sample point should be situated after these assets.

13.11 Additionally, where the treatment stream within a works divides in such a way that a single final water compliance point is not representative of all water leaving the works (i.e. there are different treatment streams which leave the works through different outlet mains), then more than one sampling point is required. In these situations, although on the same site, each treatment stream is regarded as a separate water treatment works for the purposes of the Regulations.

13.12 Refer also to guidance on regulation 16 which requires that samples are representative of the water quality at the time of sampling.

**B14. Regulation 14 – Sampling at service reservoirs**

14.1 Regulation 14 requires water companies to take a sample from every service reservoir every week it is in use. These samples must be analysed for coliform bacteria, *E. coli*, colony counts and residual disinfectant. A week is Sunday to Saturday inclusive, and if
water is supplied from a reservoir at any time during a given week, then a regulatory compliance sample must be taken.

14.2 Samples from reservoirs should not be taken on the same day each week, and companies should ensure that random selection of sampling dates is built into their sample programming procedures.

14.3 Where a service reservoir has more than one compartment with its own water inlet and outlet and the compartments are not connected hydraulically to any other compartments, then each compartment must be regarded as a single service reservoir.

14.4 Where a service reservoir has more than one compartment but the compartments are hydraulically connected and which combine into a single common outlet main, then the connected compartments may collectively be regarded as a single service reservoir and be sampled from the common outlet.

14.5 Where a service reservoir has a single main that serves as a common inlet and outlet, the water company must have arrangements to ensure that samples are taken only when the main is acting as an outlet and the water quality is therefore representative of water that has been stored within the service reservoir. Where this is not achievable, alternative representative sampling arrangements can be made.

14.6 Refer also to guidance on regulation 16 which requires that samples are representative of the water quality at the time of sampling.

B15. Regulation 15 – Sampling: new sources

15.1 Regulation 15 specifies the sampling requirements for
   (a) sources that have never previously been used for public water supply purposes and
   (b) sources which have been previously been used for public supply purposes, but not for a period of 6 months or more.

15.2 Under the requirements of Regulation 28, water companies must carry out a risk assessment for sources in both categories before using the source to supply drinking water. The risk assessment should inform the monitoring that should be undertaken to demonstrate compliance with regulation 15. These requirements apply equally to combined licensees introducing a new source for public supply purposes.

15.3 Any new abstraction point identified by a company, licensed for abstraction, represented by a sample point and intended for drinking water supply (defined by regulation 17) is deemed to be a category (a) new source, and therefore subject to the sampling, risk assessment and reporting requirements of regulation 15. Sources used previously for private supply, or non-domestic purposes, must be treated as new sources for the purposes of regulation 15.

15.4 Regulation 15(2) requires that sources in category (a) must be sampled before use for all parameters in Schedules 1 and 2 of the Regulations, and any other element, organism or substance that could cause the water supply to be unwholesome, and to ensure that necessary treatment is in place to prevent unwholesome water being supplied.

15.5 Sources in category (b) must be sampled for conductivity, pH and turbidity as soon as reasonably practicable after the source has been put into supply, and for any other
parameter, organism, element or substance whose concentration may have deteriorated since the source was last used, causing a risk to wholesomeness.

15.6 Companies’ risk assessment reports as required under Regulation 29 should be submitted to the Inspectorate at least three months before the company plans to use a category (a) source. This is because Regulation 15(4) prohibits the use of a new source for a period of three months following the date on which the Regulation 29 report was submitted to the Inspectorate.

15.7 Regulation 15(5) allows new sources to be used within three months of submission of the Regulation 29 report, with the following conditions:

i. that the source is required for emergency use only, to prevent an unforeseen loss of supply, and

ii. That a Regulation 28 risk assessment has been completed (and therefore documented) before the source is put into supply.

15.8 Where any new source is introduced into an existing treated water bulk supply, it is the responsibility of the incumbent company (the supplier) to inform the recipient and to meet the requirements of regulation 15. The receiving company must ensure that the introduction of the new source is reflected within its own water safety planning methodology and regulation 28 risk assessment for the associated supply system.

15.9 Where any new source is introduced to an existing raw water bulk supply arrangement, the company intending to use the water for public water supply purposes must ensure that the requirements of regulation 15 are met.

15.10 Regulation 15 does not apply to new bulk supply arrangements (routine, emergency or otherwise) between existing companies, including inset appointees. The receiving company should carry out a full risk assessment as required by regulation 28, ideally before the supply is used, to ensure that consumers are protected from being supplied with unwholesome water. Supplying companies should make any necessary information available to receiving companies to allow the recipient to carry out a full risk assessment.

15.11 Regulation 15(6) requires that existing treatment works not used for public supply purposes for a period of 6 months or longer must also be subject to a full Regulation 28 risk assessment before being returned to use for emergency purposes.

15.12 If a company wishes to recommission an existing treatment works and it is not an emergency, then it is best practice to take and analyse samples for an appropriate suite of parameters and other substances, elements and organisms as determined by the risk assessment, to ensure that the supply is wholesome, before any water is supplied from the works. This is irrespective of the length of time that the treatment works has been out of use.

15.13 Information Letter 06/12 includes the reporting formats for providing the necessary monitoring data and risk assessment information to the Inspectorate, and when seeking exemption from the three month rule for new sources.

B16. Regulation 16 – Collection and analysis of samples

16.1 Regulation 16 specifies the minimum quality requirements for the taking, handling, storage and analysis of samples taken for the regulatory monitoring of water supplies. These requirements are set out in regulations 16(2) and 16(5). Regulation 16(4) sets out the requirement for the retention of records to demonstrate that the sampling,
transport, storage and analysis of each sample complied with the requirements. Other paragraphs cover definitions and the procedure for authorising the use of alternative methods for microbiological analysis.

16.2 Regulation 16(2) requires that samples taken must be representative of the quality of water at the time of sampling. Sampling facilities at companies’ assets must be designed, maintained and operated to ensure that samples taken represent the quality of the water being supplied from the asset at the time the sample is taken. WRAS-approved fittings should be used as appropriate.

16.3 Companies should use the BS_EN_ISO-5667 series of documents and *The Microbiology of Drinking Water (2010) – Part 2 – Practices and procedures for sampling* to form the basis for their own internal sampling manuals and design standards for companies’ own sampling facilities. The Inspectorate expects companies to adopt the procedures and practices specified in these publications, which set down the standards required for best practice.

16.4 The department for Business Innovation and Skills (BIS) has appointed the United Kingdom Accreditation Service (UKAS) as the sole accreditation body in the UK for the purposes of assessing drinking water testing facilities and sampling arrangements in accordance with ISO/IEC 17025 and the Drinking Water Testing Specification (DWTS). Information Letter 05/2013 introduced the mandatory requirement that all companies should obtain UKAS accreditation under ISO/IEC 17025 to DWTS for all sampling, transport and analysis of drinking water that falls within the scope of the Regulations.

16.5 The accreditation of any organisation carrying out regulatory drinking water quality sampling and analysis to DWTS must include all compliance parameters and any other substance, microorganism or element analysed for the purposes of informing operational decisions. This will provide assurance to the Inspectorate that companies are complying with all the requirements of regulation 16 and, in line with the principles of better regulation, allow the Inspectorate to adopt a lighter touch approach to regulating sampling and analytical procedures.

16.6 Therefore any samples taken by a company used to establish compliance with regulation 4 (wholesomeness), including samples taken in accordance with, or to demonstrate compliance with, the requirements of regulations 6, 6A, 8, 10, 13, 14, 15, 17, 18, 19, 20, 27, 28, 30 and any other purpose to determine whether a public drinking water supply is wholesome, must be covered by the company’s DWTS accreditation for sampling and laboratory analysis. This includes samples taken as part of investigations into suspected offences committed under sections 72 and 73 of the Water Industry Act 1991.

16.7 The Inspectorate recognises that in some circumstances it may not be possible to take a sample or carry out a laboratory analysis in accordance with the company’s DWTS accreditation, for example when investigating unknown contaminants. Therefore, if a company is investigating a water quality issue and has not, or is unable to use a sampling procedure or analytical method covered by its DWTS accreditation, then that should be made clear in any report submitted to the Inspectorate. Companies are expected to maintain an awareness of and use sub-contract laboratories that can provide accredited sampling and analysis as appropriate for parameters that are beyond the scope of its laboratory’s accreditation.

16.8 In the absence of accreditation to DWTS for radioactivity parameters, the analytical methods should be covered by ISO 11929.

16.9 Regulation 16(2)(d) requires that all samples are analysed as soon as possible after they have been taken, by and under the supervision of a competent person using
suitable equipment. Detailed advice on this part of the Regulations is given in Appendix 1.

16.10 Regulation 16(3) extends the scope of the term “laboratory” to a person who may undertake analysis at the time when, and place at which, the samples are taken. Therefore the requirements of regulations 16(4), (5) and (6) cover analysis carried out on site, for example by samplers and treatment works operatives using portable testing equipment, and on-line analysers used to monitor the performance of water treatment processes, where the results or data obtained are used for any purpose as described above in paragraph 16.6.

16.11 If a company provides results or data to the Inspectorate, for any regulatory purpose, that is obtained using an instrument or method that is not covered by the company’s DWTS accreditation, then this must be made clear in any accompanying report.

16.12 Regulation 16(4) requires companies to maintain records which demonstrate that the results of samples taken for regulatory purposes comply with the requirements of regulation 16, including paragraphs 5 and 6, which specify the methods to be used for microbiological analyses and the requirements for analytical trueness (accuracy), precision and limits of detection for chemical analyses. As explained in paragraph 16.5 above, accreditation to DWTS will provide assurance to the Inspectorate that companies are complying with all the requirements of regulation 16, along with having appropriate analytical quality control systems in place, which will allow the Inspectorate to adopt a lighter touch approach to regulating analytical procedures.

16.13 If a company wishes to adopt a new analytical method for any regulatory purpose, then the method should be subject to validation as approved by the relevant Standing Committee of Analysts, and, subject to that approval, the company should then obtain accreditation under DWTS before the method is used. The Inspectorate is represented on the SCA and, therefore, if these requirements are complied with, the company will be deemed to be complying with regulations 16(7), (8), (9) and (10), whereby Welsh Ministers (i.e. the Inspectorate) are required to approve the use of any new analytical method.

16.14 Regulation 16(11) allows the Inspectorate to revoke any authorisation given under regulation 16(7), with 3 months’ notice to the company.

PART VI – DRINKING WATER PROTECTED AREAS

B17. Regulation 17 – Drinking water abstraction points: monitoring sites

17.1 Regulation 17 concerns the collection and analysis of samples of raw water used by water companies for regulation 4(1) purposes. The purpose of this sampling is primarily to inform regulatory risk assessments but will also contribute to the body of information collected by Natural Resources Wales and the Environment Agency to support the objectives of the Water Framework Directive (Directive 2000/60/EC). Further guidance on the requirements of the Water Framework Directive is provided in the joint DWI/EA guidance document The Contribution of the Water Supply (Water Quality) Regulations to the implementation of the Water Framework Directive in England & Wales, published in 2012, available on the Inspectorate’s and the EA’s websites.
17.2 Regulation 17(1) requires water companies to identify every abstraction point from which water is drawn for regulation 4(1) public supply purposes. As part of each regulatory risk assessment companies should document every licensed raw water abstraction point irrespective of whether a source is used continuously, intermittently or as standby and emergency sources.

17.3 Regulation 17(2) requires that every abstraction point is monitored for parameters, organisms and other substances as necessary, and as required by regulations 27 and 28 – i.e. to identify risks in the raw water catchment that could cause the water supply to be unwholesome, to ensure that appropriate treatment is in place and to ensure that these risks, control measures and necessary improvements are documented in the reports submitted to the Inspectorate under the requirements of regulation 29.

17.4 Every sample point must have a unique reference number and its relationship to licensed abstraction points and the aquifer or the body of surface water must be recorded. When selecting sample points, companies must ensure that they are located upstream of any treatment intended to modify the quality of the water. Treatment in this context includes blending.

17.5 Companies are required to take samples from every abstraction point in use, including from licensed river abstractions that supply surface water reservoirs. Companies may use sampling points that are located away from the abstraction point, for convenience or safety considerations, provided that the quality of water at the sampling point is representative of water at the abstraction point. In some circumstances companies may need to take additional samples from raw water inlets to treatment works at an appropriate frequency in order to monitor and verify the quality of water as it is presented for treatment.

17.6 Regulations 17(3) and 17(4) give the Inspectorate the power to specify the number of raw water samples to be taken and the nature of the analysis to be carried out and to change these requirements. The Inspectorate will form a view as to the need for such notices following assessment of companies’ regulation 29 risk assessment reports and the raw water monitoring data submitted by companies. In addition, the Inspectorate may issue such a notice as a consequence of audit findings or an assessment of a notified event.

17.7 Regulation 17(5) specifies minimum sampling frequencies for surface water which are derived from the Water Framework Directive. These minimum frequencies are purely to enable the UK to demonstrate compliance with the Water Framework Directive, and they do not bear any relation to sampling frequencies that would be appropriate to monitor parameters and other organisms, elements and substances that indicate a risk to human health. Therefore it is expected that companies will adopt a risk-based approach to raw water monitoring and will, as a principle of best practice, exceed these frequencies when considering the sampling frequencies necessary to demonstrate compliance with regulation 27 and to support regulation 28 risk assessments.

17.8 Regulation 17(5) does not require companies to take samples of untreated water for any substance, organism or element that is not a public health concern, or indicative of a risk to wholesomeness. This does to some extent depend on the raw water itself and any mitigation provided by raw water storage reservoirs and treatment processes in place. Therefore substances which can cause treatment to be compromised, for example algae, should form part of companies’ raw water monitoring strategies where they present a risk to treatment, even if the organisms themselves are not associated with a risk to human health.
17.9 The Regulations do not specify a minimum sampling frequency for raw waters from groundwater sources. Companies should take into consideration historical water quality trends, monitoring data available from other bodies (such as Natural Resources Wales), established practice for determination of sampling programmes to indicate changes or trends in raw water quality (such as technical guidance produced by the United Kingdom Technical Advisory Group (UKTAG) that supports the implementation of the Water Framework Directive - web address http://www.wfduk.org/) and any research published by the Inspectorate, for example on new and emerging contaminants likely to be present that may indicate a risk to human health.

17.10 Companies are required to submit raw water monitoring data to the Inspectorate, as specified in the Water Industry (Suppliers’ Information) Direction 2012. The Inspectorate will share companies’ raw water data with the Environment Agency in line with the principles of better regulation for the purposes of contributing to the UK monitoring under Article 7 of the Water Framework Directive. Companies should ensure that they have in place local arrangements for the sharing of other data or information required for the assessment of risks as part of their regulatory risk assessments.

PART VII – INVESTIGATIONS, AUTHORISATION OF DEPARTURES & REMEDIAL ACTION

B18. Regulation 18 – Investigations: Schedule 1 parameters

18.1 Regulation 18(1) requires that as soon as a water company has reason to believe that the water supplied fails, or is likely to fail, to meet the standards of wholesomeness specified in regulation 4 and Schedule 1, it must immediately investigate the cause of that failure or likely failure. This includes where coliform bacteria or E. coli are identified in any sample of water supplied from a treatment works, and where E. coli is identified in a sample of water supplied from a service reservoir. If coliform bacteria are identified in a service reservoir sample, in the absence of E. coli, companies should follow the requirements of regulation 18 to establish that the water supplied is not likely to become unwholesome.

18.2 Regulation 18(3) sets out the actions that an water company is required to take, including establishing the cause and extent of the failure, the Schedule 1 parameter(s) that have failed a PCV (or are likely to fail) and whether the failure is related to the domestic distribution system (regulation 18(3)(c)).

18.3 Regulation 18 requires that the root cause of the failure (or apprehended failure) and the extent of the failure is ascertained. Therefore on being informed of a failure by a laboratory companies should:

i. Take any immediate actions necessary to protect public health

ii. Carry out an immediate risk assessment to establish whether there have been any activities or operational issues in the supply system that could have caused or contributed to the failure

iii. Ascertain whether there have been any recent consumer complaints about drinking water quality in the supply system that could be related to the failure
iv. Carry out an immediate investigation into the cause and extent, taking an appropriate number of investigational samples from the sampling point, the associated distribution system and up and downstream assets as necessary, informed by the risk assessment.

v. Identify the cause and restore a wholesome supply as soon as possible

vi. Take steps to prevent a recurrence of the failure

vii. If the failure is associated with a consumers’ tap sample, then the company has a duty to establish whether the failure is caused by the private domestic system of the property. This is likely to involve, for example, taking investigational samples from additional taps in the property, pre and post-disinfection samples from the original tap in the case of microbiological failures and carrying out an inspection of the plumbing materials and fittings used in the private system.

18.4 Regulation 18(6)(a) requires water companies to notify the Inspectorate of the failure, the actions taken by the company to investigate the failure and actions taken to prevent a recurrence, as soon as possible after the failure. Unless the failure constitutes an event reportable under the requirements of regulation 35(6) that is, or is likely to give rise to, a significant risk to public health, the Inspectorate accepts reports appended to the companies’ monthly data returns, as required by the Water Industry (Suppliers' Information) Direction 2012., submitted two months’ later, as fulfilment of this requirement. A copy of any advice notice (see paragraph 18.6 below), and any formal section 75 notice issued to consumers must be appended to these reports, in order to comply with regulation 18(8). Regulation 18(8) also requires copies of these notices to be sent to the local environmental health officer. Information Letter 11/2004 sets out the requirements for these reports, with a reporting template and format for supplementary information provided in its Annexes A and B.

18.5 Regulation 18(5)(b) requires that companies at the earliest opportunity, notify other relevant suppliers who are likely to be affected by a failure, for example, recipients of bulk exports and retail licensees. The notification must include the parameter that has failed and whether the failure is likely to recur (i.e. if remedial action is required in the medium to long-term to permanently mitigate the risk), and, if the failure was a consumer’s tap failure caused by the private domestic system, any action taken by the company in relation to the failure. The last requirement would generally only apply where the consumer is a customer of a retail licensee. Exporting and importing companies should ensure that they have communication plans in place so that risks to drinking water quality can be acted upon immediately by bulk supply recipients.

18.6 Regulation 18(7) requires that where the private domestic distribution system has been established as the cause or most likely cause of a failure, companies must provide written advice (referred to as notice in writing) to the consumer (and other affected consumers, for example on the same shared service, or in multi-occupancy premises) on actions that can be taken to remove or mitigate the risk:

18.6.1 The advice notice should include:

i. the parameter that has failed;

ii. the concentration or value of that parameter in the sample taken

iii. the prescribed concentration or value of that parameter;

iv. the significance of the failure (e.g. if the water company considers that advice on health matters should be sought); and

v. the reason for the failure.
18.6.2 In the case of failures of the copper, lead and nickel parameters, companies should, as part of their investigation, establish whether running the tap before use for regulation 4 purposes reduces the concentration of the parameter to below the PCV, so that this advice can be provided along with written advice to correct the root cause(s) of the failure.

18.6.3 Similar advice may be appropriate for taste and odour failures associated with unapproved materials, and where iron and turbidity have exceeded the PCV because of the condition of the private supply pipe.

18.6.4 Microbiological failures attributed to the hygienic condition of the tap should be followed up with written advice to the consumer about maintaining tap cleanliness.

18.6.5 The written advice notice should also be sent to any other relevant supplier that uses the private domestic supply system for supplying water to consumers who might be affected. This might include, for example, a retail licensee, or the owner or operator of a private "onward" distribution system. A private onward distribution system is where a premises owner and bill payer who is not an undertaker or licensed supplier supplies water to other users, covered by regulation 8 of the Private Water Supplies (Wales) Regulations 2010 as amended, or the Private Water Supplies (England) Regulations 2016.

18.6.6 The relevant supplier should then make the notice available to its own consumers, as required by regulation 18(8).

18.6.7 Failure to provide appropriate written advice to the consumer under these requirements constitutes a failure to comply fully with regulation 18.

18.7 In extreme situations, where a failure caused by a private domestic system in a building that is not a public building (see under regulation 21), and where the failure is indicative of a significant risk to health, companies should seek to ensure that the defect is corrected, if necessary using their powers to prevent contamination, as vested by section 75(2) of the Water Industry Act 1991. Companies should apply judgement in these situations, and ensure that any formal action they take is proportionate to the identified risk to health. Remedial action that can easily be carried out by the water company, for example cleaning a tap, does not warrant the issue of a section 75(2) notice.

18.8 Companies may consider it appropriate to issue section 75(2) notices to landlords of private domestic properties that are rented to tenants, to correct plumbing defects that could cause a risk to health, where the tenant is not empowered to correct the defect themselves. This is because, under section 73 of the Act, the tenant is potentially committing an offence through no fault of their own.

18.9 Companies should also have robust communication arrangements in place with retail licensees, to ensure that the customers of retail licensees can be provided with appropriate advice in the event of a drinking water quality emergency.

18.10 Regulation 18(9) establishes that if a company has submitted a report to the Inspectorate under the requirements of regulations 18(5) and (18(6), then they do not need to comply with the requirements of regulation 35(6)(a)(iv).

18.11 Regulation 18(10) relates to failures of copper and lead. Where there has been a failure of either of these parameters, or where the company has identified a likelihood of failure, the company must replace any part of the consumer’s service pipe that is owned by the company that may contribute to the cause of the failure. Typically, this will be where the company’s communication pipe is made from lead, or more rarely, copper. The presence of galvanised iron can also increase the risk of lead failures, and
brass fittings may impart lead into the drinking water supply, so companies should investigate and, where necessary, replace, any such pipes and fittings that they own to comply with this regulation.

**B19. Regulation 19 – Investigations: indicator parameters**

19.1 Regulation 19(1) requires that as soon as a water company has reason to believe that the water supplied does not meet, or is unlikely to meet, the specification for an indicator parameter it must **immediately** investigate the cause of that failure or likely failure. As with regulation 18, this regulation applies to any sample.

19.2 Regulation 19(1) requires that the root cause of the failure (or apprehended failure) is ascertained in order to establish whether the failure is indicative of an unwholesome supply. Therefore investigation of indicator parameter failures requires a similar approach to investigating failures of Schedule 1 parameters, although the risk to human health is likely to be lower, and therefore the scope of the company’s investigation may be reduced.

19.3 If the failure is associated with a consumers’ tap sample, then, as with Schedule 1 parameters, the company has a duty to establish whether the failure is caused by the private domestic distribution system of the property. The investigatory steps required would, therefore, be similar to those outlined in paragraph 18.3 above.

19.4 Regulation 19(4)(a) requires that where the private domestic distribution system has been established as the cause or most likely cause of a failure, companies must provide written advice (referred to as notice in writing) to the consumer (and other affected consumers) on actions that can be taken to remove or mitigate the risk:

19.4.1 The advice notice should include:

   i. the indicator parameter that has failed;
   
   ii. the concentration or value of that indicator parameter in the sample taken
   
   iii. the specified concentration or value of that indicator parameter;
   
   iv. the significance of the failure (e.g. if the water company considers that advice on health matters should be sought); and
   
   v. the reason for the failure.

19.4.2 Microbiological failures attributed to the hygienic condition of the tap should be followed up with written advice to the consumer about maintaining tap cleanliness.

19.4.3 The written advice notice should also be sent to any other relevant supplier that uses the private domestic supply system for supplying water to consumers who might be affected. This might include, for example, a retail licensee, or the owner or operator of a private “onward” distribution system. A private onward distribution system is where a premises owner and bill payer who is not an undertaker or licensed supplier supplies water to other users, covered by regulation 8 of the Private Water Supplies (Wales) Regulations 2010 as amended, or the Private Water Supplies (England) Regulations 2016.

19.4.4 The relevant supplier should then make the notice available to its own consumers, as required by regulation 19(5).

19.4.5 Failure to provide appropriate written advice to the consumer under these requirements constitutes a failure to comply fully with regulation 19.
19.5 It is unlikely that the failure of an indicator parameter attributed a privat e domestic system would justify a company exercising its powers under section 75(2) of the Act.

19.6 Regulation 19(3)(a) requires water companies to notify the Inspectorate of the failure, the actions taken by the company to investigate the failure and actions taken to prevent a recurrence, as soon as possible after the failure. The Inspectorate accepts reports appended to the companies’ monthly data returns, as required by the Water Industry (Suppliers’ Information) Direction 2012, submitted two months’ later, as complying with this requirement. A copy of any advice notice issued to consumers must be appended to these reports, in order to comply with regulation 19(4)(b). Regulation 19(4)(b) also requires copies of these notices to be sent to the local environmental health officer.

19.7 Regulation 19(2)(b) requires that companies notify other relevant suppliers who are likely to be affected by a failure, for example, recipients of bulk exports and retail licensees. Refer to paragraph 18.5 above.

19.8 Turbidity – turbidity is an indicator parameter which is required to be measured at treatment works sample points, as well as in water supply zones. The specification for turbidity at treatment works is 1 NTU, whereas in water supply zones a national standard of 4 NTU applies.

19.8.1 An exceedance of the turbidity indicator specification at a treatment works outlet does not in itself represent a direct risk to human health. The specification is applied because an elevated level of turbidity may compromise the effectiveness of chemical and ultra violet disinfection.

19.8.2 Additionally, the importance of optimising the operation of water treatment works to effectively remove Cryptosporidium oocysts has been identified by the Expert Groups on Cryptosporidium in water supplies. An important element of this is controlling the effectiveness of particle removal by reference to the turbidity of filtered and final waters. Therefore any exceedance of the indicator specification at a treatment works should initiate an investigation into the cause in line with the recommendations in the reports of the Expert Groups on Cryptosporidium in water supplies.

19.9 Radioactivity - Failures of a specification for any of the radioactivity parameters must followed up with an investigation into the source, and an assessment of the risk to public health:

19.9.1 Where a failure of a specified value occurs, whether in a regulatory compliance sample, or in an operational sample, the company should carry out a catchment risk assessment to identify possible sources of the radioactivity, and monitor for additional radionuclides based on risk assessment. Schedule 5 of the Regulations lists some of the more common radionuclides associated with artificial sources. The risk assessment should include consulting with the Natural Resources Wales to ascertain whether there have been any recent discharges of radioactive substances into the catchment, or any new potential sources. The presence of tritium in water is associated with anthropogenic sources.

19.9.2 The investigation into the source of the radioactivity should, therefore, include investigational monitoring for Indicative Dose (gross alpha and gross beta activity), radionuclides listed in Schedule 5 of the Regulations and any additional radionuclides indicated from the risk assessment. If any radionuclide detected exceeds the derived concentration given in the table of derived concentrations in Schedule 5, then the Inspectorate should be informed, and advice sought from Public Health Wales (PHW) or Public Health England (PHE)
to determine whether any action is needed to protect human health. The UK Recovery Handbooks for Radiation Incidents 2015, Drinking Water Supplies Handbook, version 4 (published by PHE), shall be followed for the investigation.

19.9.3 If the indicative dose calculated from the derived concentrations of all radionuclides detected exceeds 0.1mSv, then the Inspectorate should be informed and advice should be sought from Public Health Wales to determine whether any action is needed to protect human health.

19.9.4 It is likely that more than one set of investigational samples will be required in order to confirm the risk. Samples taken as part of the investigation should be representative of the water being consumed and analysed appropriately in accordance with half-life decay pathways.

19.9.5 If radon is detected at levels greater than 100Bq/l, then investigatory monitoring should be undertaken at consumers' taps in addition to enhanced monitoring at the treatment works, and if the level detected is a cause for concern, based on advice from PHW or PHE, or from the Inspectorate, then the company should investigate actions necessary to reduce the concentration in water supplied to consumers. Any result greater than 1,000Bq/l must be reported to the Inspectorate as an event, as required by regulation 35(6) and remedial action will be secured through a regulation 20(4) notice.

19.9.6 Guidance on investigating ID is also provided in the previous paragraph 6.10.6. The Public Health England UK Recovery Handbooks for Radiation Incidents 2015, Drinking Water Supplies Handbook, as cited above, provides additional information. If ID is found to exceed 0.1mSv, then this should be reported to the Inspectorate as an event, as required by regulation 35(6).

19.9.7 If any isotopes of uranium are detected through a company's radioactivity monitoring, the company should analyse samples for uranium in µg/l to ensure that the concentrations of uranium present do not present a risk to wholesomeness by virtue of the element's chemical toxicity. The WHO guideline value (GV) for uranium is 30µg/l. If uranium is detected at a concentration exceeding the GV, then it should be reported to the Inspectorate as an event and Public Health Wales should be consulted to determine whether any action is needed to protect human health.

B20. Regulation 20, 22, 23, 24, 25, 26 – Action by Welsh Ministers - Authorisations

20.1 Authorised departures from the prescribed or specified concentrations or values are permitted under regulation 20 for certain parameters, and these regulations set out the process for issue, publication, terms and conditions and revocation. Authorised departures are known as derogations in the Directive.

20.2 The European Commission (EC) has advised that provision for derogations was included in the Directive to allow member states time to take necessary steps to comply with all of the standards. The Directive was published in 1998 and, therefore, the EC considers that it should now be unlikely that any member state should require new derogations. However the provision to apply for derogations still exists, and, if
circumstances warrant, the Inspectorate will consider issuing authorisations, assessed on a case by case basis.

20.3 Regulation 20(4) imposes a duty on the Inspectorate to issue Notices requiring action to be taken in respect of failures of indicator parameters, where the Inspectorate considers that the failure poses a potential danger to human health. The Notice may require the company to take remedial action to ensure that the water supplied to consumers is not at risk of being unwholesome.

B21. Regulation 21 – Failure attributable to domestic distribution system where water is supplied to the public

21.1 The Directive requires that water supplied for domestic purposes in buildings where the water is made available to the members of the public must be wholesome. Regulation 21 specifies the response required where a failure of a Schedule 1 parameter or a Schedule 2 (indicator) parameter is attributable to the private domestic distribution system in such premises, commonly referred to as “public buildings”. The regulation places a duty on the Inspectorate to ensure that, where necessary, remedial action is taken to prevent recurrence.

21.2 The Inspectorate has published research into the extent of public buildings in England & Wales and summarised the findings in Information Letter 10/2004. This Information Letter included a list of the most common types of premises that are deemed to be buildings where water supplied for regulation 4(1) purposes is made available to members of the public. Water companies are required to include public buildings in their random sampling programme and identify these in their monthly compliance data returns through the use of the “PB” flag in their data returns.

21.3 Companies should exercise judgement when deciding whether premises fall within the definition of a public building or not. Regulation 21(1)(a) specifies that schools, hospitals and restaurants are included in the definition. Essentially, however, public buildings are any premises where a member of the public could reasonably expect to be served with a drink made with tap water, or where there is a drink vending machine connected to the cold water system that is openly accessible to members of the public. This includes community centres, village halls and places of worship that have kitchens where refreshments are prepared for public consumption. It also includes premises such as hairdressers and sports centres which may not have the facility to serve drinks, but where members of the public can come into close contact with tap water through washing and showering.

21.4 Samples in public buildings should be taken at a tap normally used to supply water to the public or for food preparation purposes. Companies should apply the same sampling method to taps in public buildings as they do to taps in domestic premises.

21.5 If a sample taken at a public building fails for a parameter or indicator parameter, Regulations 18 and 19 must be followed in their entirety. Where the company’s investigation identifies that a failure is attributable to the private domestic system or the maintenance of that system, water companies must consider whether the problem can be adequately addressed through advice to the building occupier or owner, or if action is required by them or the building owner under Sections 74 and/or 75 of the Water Industry Act.

21.6 It is anticipated that remedial action to prevent a failure recurring can be normally be achieved through local agreement. However, under regulation 21, where the Inspectorate considers any such failures to be:
i. not trivial,
ii. likely to recur,
iii. and, in the case of an indicator parameter, pose a potential danger to human health,

the Inspectorate must serve a notice on the water company supplying the premises that requires the undertaker to exercise its powers under section 75(2) of the Act. This means that the provisions of this regulation convert the undertaker’s power to serve a notice into a duty to serve a notice in order to ensure that necessary remedial action is carried out. The requirement to comply with a notice from the Inspectorate is enforceable under section 18 of the Act.

21.7 A section 75(2) notice served as a result of a regulation 21 notice must require the consumer (building owner or occupier) to take the steps specified in the notice to prevent a recurrence of the failure, or likelihood of failure. If the consumer fails to take the remedial action specified in the water company’s notice then the company must take the remedial action itself and is entitled to recover necessary costs from the consumer.

21.8 Regulation 21(6) requires that where a water company has served a section 75 notice in response to a notice served on it under regulation 21, the water company must inform affected consumers of the action that it has taken. This must include a copy of any notice that the company has served on the building owner/occupier. Companies should work with the building owners/occupiers or facilities management representatives to ensure that appropriate steps are taken to make consumers aware of the remedial action taken – for example publication of the notice on a public information board, or in the proximity of the main drinking water facilities.

21.9 Regulation 21(7) relates to failures attributed to private “onward” distribution systems, where a third party who is not an undertaker or a licensed supplier supplies water to other users. These supply systems are covered by regulation 8 of the Private Water Supplies (Wales) Regulations 2010 as amended, or the Private Water Supplies (England) Regulations 2016. Where such an arrangement supplies a public building, and a failure is attributable to the domestic distribution system and the Inspectorate considers that a local authority requires information or assistance from a water company so that the authority can enforce the requirements of the Private Water Supplies Regulations, then the Inspectorate must serve a notice on the water company requiring the provision of certain information.

21.10 The Inspectorate expects that sharing of relevant information will normally form part of the discussion between local authorities and water companies and the need to serve such a notice would be limited to exceptional circumstances. An example of this might be where the local authority required information from the water company on where the water company’s network meets the private distribution system in order to identify which assets come under the Private Water Supplies Regulations, but such information has not been made readily available or communication channels have broken down preventing resolution of the drinking water quality issue.

PART VIII – WATER TREATMENT

B27. Regulation 27 – Disinfection and other treatment arrangements
27.1 Regulation 27 requires all water supplied for regulation 4(1) purposes to be disinfected. Where necessary the water also has to be subject to sufficient preliminary treatment. The point at which water is considered to be supplied for regulation 4(1) purposes is when it leaves the treatment works (regulation 27(6)(c)).

27.2 Disinfection is explicitly defined in regulation 2 and sufficient preliminary treatment is also defined in regulation 27(6)(b) – see below.

27.3 The choice of treatment and disinfection processes is not specified in the regulation. This means that companies are free to decide on the most appropriate technology to apply at each treatment works. The Inspectorate expects companies to have in place a water treatment policy and a disinfection policy covering all of the requirements of regulation 27 for each of its treatment works. Both the design and operation of treatment works must be covered by this policy which should be kept under regular review and be informed by appropriate studies and technical performance data. The Inspectorate also expects there to be documentation and procedures in place which ensure that at every treatment works it is unambiguous how regulation 27 is being met both in principle and in practice.

27.4 Companies’ disinfection policies should be informed by sound science and by knowledge of the occurrence of pathogens in water sources in England and Wales, using information available from Public Health England and Public Health Wales. The disinfection policy should cover the design, maintenance and operation of all relevant components of companies’ treatment works.

27.5 Regulation 27(6)(b)(i) defines the preliminary treatment that companies must have in place to prepare water for disinfection. This means that companies must treat the water to modify its quality in respect of any properties (e.g. pH) and substances (e.g. ammonia) known to adversely affect the performance of the disinfection process (or processes). Where no preliminary treatment takes place the Inspectorate expects the company to be able to demonstrate from robust data why no preliminary treatment is required.

27.6 Regulation 27(6)(b)(ii) specifies that the turbidity of water presented for disinfection must be less than 1 NTU at all times.

27.7 It is best practice to have in place at each treatment works, continuous on-line monitoring for turbidity, residual disinfectant and other parameters that affect the effectiveness of disinfection (for example pH, ammonia, residual coagulant metals), with appropriate alarms, alarm-response procedures and automated fail-safe mechanisms in place, to prevent undisinfected or partially disinfected water from being put into supply. Such measures significantly reduce the risk of failure to comply with regulation 27, and can ensure that 27(6)(b)(ii) is complied with.

27.8 Where chlorine is used as a disinfectant and a minimum contact time is required to achieve effective disinfection, the company should ensure that robust arrangements are in place for ensuring adequate contact time at all times, preferably through use of a purpose-designed, baffled contact tank that has been demonstrated to achieve optimum plug-flow conditions. Contact tanks should not be used to provide on-site storage or for blending with other supplies, and arrangements should be in place to ensure that water from the distribution network is not able to flow back into the contact tank. If any of these situations apply, the Inspectorate considers that regulation 27(2)(b) is unlikely to be complied with (see also paragraph 27.15 below).

27.9 Regulation 27(2)(a) requires that disinfection systems are designed and operated in such a manner that the formation of disinfection by-products (DBPs) is minimised. Companies should focus their activities to minimise the formation of disinfection by-products on identifying and removing DBP pre-cursers and avoiding conditions that
encourage the formation of DBPs, whilst ensuring disinfection itself is not compromised.

27.10 The regulations set a parametric value of 100µg/l for trihalomethanes (a group of four disinfection byproducts, namely chloroform, bromoform, dibromochloromethane and bromodichloromethane) and 10µg/l for bromate. Furthermore, regulation 4(2) states that for water to be considered wholesome it must not contain any substance which alone or in conjunction with any other substance constitutes a potential danger to human health. Therefore, while there may not be specific parametric values for DBPs other than THMs and bromate, they must not be present in concentrations that constitute a potential danger to human health.

27.11 The factors which influence DBP formation include:
- The type and purity of disinfectant used
- The concentration of disinfectant used
- Concentrations of organic matter and other DBP precursors present in water presented for disinfection
- Temperature
- pH
- Contact time
- Length and condition of the distribution network.
- Rechlorination in the distribution network

27.12 The use of sodium hypochlorite and chlorine dioxide can cause the formation of chlorite and chlorate. Where these chemicals are used, companies should regularly monitor for these DBPs to ensure that the WHO GVs are not exceeded, and that the supply remains wholesome at all times.

27.13 Where ozonation is practised, there may be a risk of bromate formation, in which case companies should monitor bromate levels at appropriate points in the treatment process. It is also good practice to monitor total organic carbon upstream of ozonation, so that the ozone dose can be controlled to minimise the risk of DBP formation. Companies should assess the level of bromide in the raw water and include bromide in the risk assessment for the treatment works.

27.14 Information on other DBPs, and guideline values, can be found in Chapter 8 of the *WHO Guidelines for drinking-water quality*, fourth edition 2011. Companies should include other DBPs as appropriate, in their monitoring strategies, to confirm that regulation 27(2)(a) is complied with.

27.15 Regulation 27(2)(b) requires that disinfection processes must be verified. The Inspectorate expects companies to be doing this as part of existing operational practices covered by the policies and procedures described in paragraph 27.3 above. The absence of indicator bacteria is insufficient on its own to show that water has been disinfected, and verification should be assessed through the removal or inactivation of pathogens through the whole treatment process, including final disinfection. Companies must be able to demonstrate that the treatment processes are designed for the challenge present in the raw water, and that they are operated within these design criteria. An additional useful reference source is Chapter 7 of the *WHO Guidelines for drinking-water quality*, fourth edition 2011, which contains information on the effectiveness of a variety of disinfecting agents against a range of microbial pathogens.
B28. Regulation 28 – Risk assessment

28.1 The regulation requires a comprehensive risk assessment for every treatment works and connected supply system that covers all hazards and hazardous events that could present a risk of supplying water that could cause a risk to public health or an unwholesome supply, as defined by regulation 4(4).

28.2 These risk assessments should be undertaken using the water safety plan approach published by WHO in Chapter 4 of the WHO Guidelines for drinking-water quality in 2011.

28.3 The water safety plan approach provides a means of identifying hazards and hazardous events that potentially could arise in the catchment area for the source, during treatment, within the distribution system and within building plumbing systems (up to the consumer’s cold water tap). The methodology requires risk to be characterised for each hazard/hazardous event using a scoring system based on likelihood and consequence criteria. Risks should be characterised before (uncontrolled) and then after taking account of permanent control measures in place. The scoring method should be capable of identifying residual risks that require further mitigation (control measures) to be put in place.

28.4 A risk assessment carried out under regulation 28 should take into consideration all parameters, elements, substances, micro-organisms including parasites, algae and viruses and all variants that are indicative of a risk to drinking water quality and wholesomeness. Companies should use all available information when assessing the likelihood of a hazard being present or a hazardous event taking place.

28.5 Risks to raw water quality should use information obtained from abstraction point monitoring carried out under regulation 17, catchment surveys and information on pesticide usage to identify chemicals which could be detected in raw water through their usage or properties. Companies may use agronomists or other expert services working in this area to provide information on agrochemical usage in catchments. Natural Resources Wales or the Environment Agency should be consulted for data and information that they may have available. The output of catchment risk assessments should be used to confirm water treatment needs.

28.6 Risk assessments should be kept under continual review, and companies should have documented processes in place to capture new information, changes to residual risks and to agree and prioritise actions required for mitigating residual risks.

28.7 Companies should mitigate risks in an expedient manner to ensure that uncontrolled risks to public health and wholesomeness are not allowed to persist for unacceptably long periods of time. If permanent mitigation involves the implementation of a medium- or long-term solution, interim operational measures should be put in place to ensure that consumers are not supplied with unwholesome water.

28.8 Companies receiving bulk imports of treated water from other companies should obtain information from suppliers necessary to conduct their own risk assessments. Ideally, suppliers should make available the reports and other information submitted to the Inspectorate under the requirements of Regulation 29 (see below). Recipients of bulk imports should have formal levels of service agreements in place with their suppliers that cover, amongst other things, water quality, sufficiency, information sharing, communication channels for emergencies and contingency plans in the event of a water quality problem or loss of supply.
28.9 Regulation 28(5) allows the Inspectorate to serve a notice on a company to carry out a risk assessment under the requirements of regulation 28, by a date specified.

28.10 Regulation 28(6) requires water companies to inform the Inspectorate as soon as it becomes aware of any change to a residual risk that requires new or additional mitigation steps. Companies are now required to report updated risk assessment reports to the Inspectorate every month as part of the monthly data returns following IL 01/2015, which fulfils the requirement of this regulation.

B29. Regulation 29 – Procedure following risk assessment and prohibition of supply

29.1 Regulation 29 sets out the reporting requirements for companies’ risk assessments carried out under regulation 28. Under this regulation, companies are required to inform the Inspectorate as soon as it becomes aware of any new risk to public health or wholesomeness. As explained in paragraph 28.10 above, the monthly reporting arrangements fulfil this requirement.

29.2 Information Letter 02/2014 established the basis for this reporting framework, updated with Information Letter 01/2015. Both of these Information Letters and supporting annexes are available on the Inspectorate’s website.

29.3 Under Regulation 29(4) the Inspectorate has the power to issue a notice to companies on receipt of a risk assessment report that identifies a risk to public health or wholesomeness that requires additional mitigation (control measures). Such a notice will specify actions to be taken and completion dates, and may be issued without prior consultation with the company. In practice, a documented procedure is in place whereby companies agree with the Inspectorate appropriate steps to be taken, and suitable timescales. Refer also to the Inspectorate’s Enforcement Policy. If a company can demonstrate that it has a robust action plan in place to mitigate a risk within an appropriate timescale, and the company has a good track record in risk management and complying with existing notices, then the Inspectorate is likely to deem it unnecessary to issue a formal notice.

29.4 Regulation 29(4)(d) allows the Inspectorate to place conditions in a regulation 29(4) notice to not supply water from a treatment works, service reservoir or other asset unless the specified conditions are met. Failure to comply with a (4)(d) condition constitutes a criminal offence under the provisions of regulation 33(1).

29.5 Regulation 29(6) allows the Inspectorate to revoke or amend a regulation 29 notice, which will only normally be done once the Inspectorate is satisfied that, having received sufficient evidence from the company that all the conditions and steps in the notice have been complied with, the required reduction in risk and other benefits have been achieved.

29.6 Where a company seeks to change a step in a notice, for example because a new solution has been identified which provides improved mitigation for the identified risk, the process is explained in Information Letter 02/2015 - Legal Instruments - Processes for reporting on, agreeing changes to and closure/revocation. The forms that companies should use when applying for changes are appended as annexes to the letter, and are available on the Inspectorate’s website.
B30. Regulation 30 – Contamination from pipes

30.1 Regulation 30 requires that, where there is a risk in a company's supply system of copper and lead parameters failing the PCV because of the prevalence of these materials in service pipes, the company is required to treat the water supplied to minimise plumbo- and cupro-solvency. This means that water put into supply must be chemically stable, by treatment if necessary, and, where there is a high risk of lead failures, treated to minimise plumbosolvency. The latter is normally carried out by dosing the supply with a phosphate chemical.

30.2 Regulation 30(3) allows a company to decide not to treat the water as specified above where there is evidence to demonstrate that the treatment is unlikely to achieve a significant reduction in the levels of copper or lead, or where such treatment is not reasonably practicable. The Inspectorate expects that companies should be able to provide evidence to demonstrate these conditions.

30.3 Regulation 30(4) applied up until 25th December 2013, requiring a company to replace its part of any service pipe (normally the communication pipe) that is made from lead or where the major component is lead, where a property owner has replaced or intends to replace their private lead supply pipe and there is a risk of lead exceeding the PCV at the consumer’s tap. This regulation has been superseded by regulation 18(10), where the same principle applies, because if there is a lead service pipe in situ it follows that a failure of the standard for lead is likely. Therefore, if a consumer has indicated in writing that he/she has, or intends to, replace the lead supply pipe, the company must replace its own part of the service pipe that is made of lead, in order to eliminate the potential for any future exceedance of the PCV for lead.

30.4 Lead can be imparted into the water supply from lead solder present in the domestic system and unapproved fittings, including brass fittings. Therefore companies should consider these factors when assessing the risk of failing the PCV for lead. The risk assessment might include sampling as well as a plumbing inspection.

B31. Regulation 31 – Application and introduction of substances and products

31.1 The purpose of this regulation is to provide control over the use by water companies of substances and products that come into contact with drinking water to ensure that they do not cause the water supply to be unwholesome.

31.2 Regulation 31(1) prohibits, with certain exceptions, the introduction by water companies of any substance or product to water that is intended for domestic purposes as defined in regulation 4(1). The exceptions are that the product or substance, at the time of its introduction, satisfies one of the conditions in regulation 31(4) or conforms with the conditions set out in regulation 31(3).

31.3 Regulation 31 also covers materials used in the construction of treatment and storage tanks, service reservoirs, pipes, pumps, valves and other assets where there is surface contact with water supplied for Regulation 4(1) purposes. This includes transportable tanks and bowser used for providing temporary supplies, and vehicle tankers used to transport drinking water for topping up service reservoirs and injecting directly into distribution systems. Manufacturers’ instructions for use must be followed.
31.4 The List of Approved Products for Use in Public Water Supply in the United Kingdom is published and updated regularly on the Inspectorate’s web site. It represents the definitive list of all substances and products for which approval has been granted under regulation 31(4)(a) (and so may be introduced into a water supply system), refused, modified, revoked or prohibited. The list also makes clear any restrictions or conditions applied to the use of such products that must be observed.

31.5 The list additionally identifies those products (currently some treatment chemicals and filter media) which may be introduced by water companies because they conform to a European Standard (BS:EN), subject to any national conditions of use to protect public health imposed under regulation 31(3).

31.6 It is the responsibility of the water company to ensure that products used in the production, supply and distribution of drinking water are appropriately approved, under regulation 31(4)(a), or meet the requirements of regulation 31(4)(b) or (c) before introducing them into the water supply.

31.7 It is the responsibility of water companies to ensure that any product conforming to a BS:EN, which may be used under regulation 31(3), conforms to the relevant BS:EN standard. Water companies should ensure that procurement arrangements and purchasing contracts are sufficiently robust to require suppliers to meet the specifications at all times, and to provide evidence of conformity as appropriate, for example certification with batches of treatment chemicals. Companies should also have arrangements in place to audit suppliers, if appropriate, and the facility to verify supplier’s arrangements for ensuring conformity through visiting production facilities and carrying out checks on suppliers’ laboratories.

31.8 Water companies should note that BS:EN standards for drinking water treatment chemicals and products do not contain mandatory requirements for attestation of conformity.

31.9 Full guidance on regulation 31 matters is available separately on the Inspectorate’s website http://www.dwi.gov.uk. This also gives additional guidance on when approval is not required before introduction of a product because it is likely to satisfy regulation 31(4)(b), or when it may be introduced for research purposes (with prior notification and for a limited period) under regulation 31(4)(c).

B32. Regulation 32 – Use of processes

32.1 Under regulation 32 the Inspectorate may give notice to a water company requiring them to make an application for approval of any process. The notice may also prohibit use of the process for a specified period. Regulation 32 also provides for attaching conditions to an approval and for revocation of approval and modification of conditions of approval and publication of a list of approved processes. Provisions equivalent to those prescribed in regulation 31 in respect of giving notice apply to regulation 32.

B33. Regulation 33 – Offences

33.1 Under regulation 33, a water undertaker or combined licensee who contravenes regulation 27(1), 27(3) relating to disinfection and treatment arrangements, or any regulation 29(4)(d) notice conditions is guilty of an offence. Companies have a
statutory defence if they are able to show that it took all reasonable steps and exercised all due diligence to avoid committing the offence.

33.2 Regulation 33(3) creates a criminal offence for the following contraventions of regulation 31:

- 31(2) (introduction or application of products/substances not permitted by the regulation)
- 31(8) (contravention of a prohibition notice)
- 32(1) (use of a process in contravention of a prohibition notice)
- 32(2) (failure to observe conditions of approval of a process)

33.3 Regulation 33(4) provides for prosecution of anyone providing false information in support of an application under regulation 31 or 32. Proceedings for the offence providing false information in this manner can only be instigated with the consent of the Welsh Ministers (in practice the Chief Inspector of Drinking Water) or the Director of Public Prosecutions.

PART IX – RECORDS AND INFORMATION

B34. Regulation 34 – Maintenance of records

34.1 Regulation 34(1) details the information that companies, including combined licensees, must record and make available to the public on request. The public record may be in hard copy or electronic format. The entries for the results of compliance analysis should be reported in the units of the Regulations.

34.2 Regulation 34(2) places duties on companies holding retail licenses to maintain a public record, and it details the information that retailers must include in that record.

34.3 Regulation 34(5) requires that records are reviewed and updated every year.

34.4 Regulation 34(6)(a) requires that records containing details of water supply zones, including zone names, the names of treatment works, service reservoirs and supply points supplying the zones, the results of samples taken under the requirements of Part 4 of the Regulations, and the results of samples taken in accordance with regulations 12 to 14, 17 and 29, must all be kept for a minimum period of 30 years after the date that an item of data or information was first entered into the record. This applies to undertakers, inset appointees, combined licensees and retail licensees.

34.5 Regulation 34(6)(a) requires that all other records referred to in regulations 34(1) and 34(2) are kept for a minimum period of 5 years after the date that an item of data or information was first entered into the record.

B35. Regulation 35 – Provision of information

35.1 Regulation 35(1) requires a company to send any person a copy of the regulation 34 record within 7 days of receipt of a request. This allows a company to provide public record information either by post, email or through their website. If the person requesting information relating to a specific water supply zone (including treatment works and reservoirs supplying the zone) is supplied with water from that zone, then
the information must be provided free of charge. For all other information requests a reasonable charge may be made.

35.2 Regulation 35(5) requires the company to notify consumers of their rights under regulation 35(1) every year through the billing process.

35.3 Regulation 35 paragraphs (1) to (5) apply to undertakers, inset appointees, combined licensees and retail licensees.

35.4 Regulation 35(6) requires that any event affecting the quality of drinking water supplies that is likely to give rise to a significant risk to health must be reported, as soon as possible, to the Inspectorate and every appropriate local authority, Public Health Wales, and/or if the area supplied is in England, the equivalent English authorities. This regulation forms the basis of the event reporting requirements, clarified by paragraph 9 of the Water Industry (Suppliers' Information) Direction 2012. Companies are expected to keep their contact arrangements with external organisations under continual review, particularly in respect of 24 hour (out of hours) contact details.

35.5 In the context of discussing matters relating to drinking water quality it should be kept in mind that the nature of these communications will involve the exchange and interpretation of technical information. Therefore these communications are most effective when they are conducted between professionals - a CCDC and a senior public health or water quality scientist for the water company. Further guidance is also given in the joint DWI/HPA publication: Drinking water safety - a guide to health and water professionals on the Inspectorate’s website. If a water company is concerned about the public health communications during any notified event they should seek assistance from the Inspectorate.

35.6 Companies should bear in mind that the role of the Inspectorate in any event which threatens to become an emergency is as the appointed technical advisor to the Secretary of State.

PART XI – ENFORCEMENT

B38. Regulation 38 - Contraventions by relevant suppliers

38.1 Regulation 38 confirms that any duty on a water company conferred by Parts 4 to 9 of the Regulations is enforceable under section 18 of the Water Industry Act 1991. Refer also to the Inspectorate’s Enforcement Policy available on the DWI website.
APPENDIX 1: REGULATION 16 – ANALYSIS OF SAMPLES

A1 Training of analysts

A1.1 Water companies or their analytical contractor should produce a comprehensive analyst training manual and programme to cover all aspects of analysis.

A1.2 Once trained, all analysts’ performance should be monitored and subject to regular audit. Monitoring and audit procedures, criteria for satisfactory performance and policy on retraining should be documented.

A1.3 A training record should be produced for each analyst detailing the training given, with dates and assessment of competence to perform the task, results of any audits, any retraining or further training given and any re-assessment of that competence.

A1.4 Guidance on the competence requirements of analysts, their supervisors and laboratory technical and quality management required to comply with regulation 16(2)(d)(i) is given in Information letter 08/2007.

A2 Suitability of equipment

A2.1 In addition to equipment being of the type specified in the analytical procedure, it must comply with each of the following requirements before it can be regarded as suitable for the purpose:

(i) located and used in appropriate conditions;

(ii) maintained according to the manufacturer’s recommendations or auditable equivalent procedures;

(iii) have a current calibration that is both valid and traceable to national and international standards;

(iv) be used in accordance with the manufacturer’s operating instructions or auditable equivalent procedures; and

(v) demonstrably comply with all system suitability and analytical quality control criteria.

A2.2 General advice on calibration is given in ‘Guidelines for Calibration in Laboratories’ which is available on the DWI web site (www.dwi.gov.uk).

A2.3 Sub-paragraph (e) of regulation 16(2) requires that all analysis, including field tests, must be subject to a system of analytical quality control (AQC) sufficient to demonstrate that the requirements of regulation 16(5) have been complied with for each analysis. For microbiological parameters either the specified method or an approved alternative must be used in conjunction with the practices and procedures given in ‘The Microbiology of Drinking Water (2002)’.

A2.4 Appropriate systems of AQC for all other parameters will include:

- Performance testing of the analytical system;
• Routine internal AQC; and
• External AQC (proficiency testing), if a suitable scheme is available.

A2.5 Sub-paragraph (e)(ii) of regulation 16(2) requires that a laboratory’s system of AQC is subject to independent checking by a person who has been approved by the Secretary of State for that purpose.

A3 Initial Performance testing

A3.1 Each laboratory or field testing organisation is required to have tested the performance of the analytical methods used for each parameter or each determined constituent of a parameter, and to have demonstrated that the system is capable of meeting the requirements set out in paragraph 16(5) and Schedule 4 before that system is used for routine analysis of compliance samples. Performance testing should cover the entire analytical procedure, including any sample preparation and concentration steps. Testing must be carried out in a manner emulating that used routinely, without taking special precautions which would not generally apply to achieve optimum performance.

A3.2 An analytical method is the specific combination of laboratory, analysts, instrumentation and analytical procedure used to analyse the sample, including any sample preparation or pre-treatment steps. Provided all analysts have been trained to the same standard and their competence has been assessed using the same criteria they can be regarded as equivalent for the purposes of initial performance testing of the analytical method.

A3.3 The analytical method should be subjected to testing of its trueness, precision and limit of detection, including spiking recovery and resilience against possible interferences. The minimum acceptable specifications for performance testing are given below. The design of tests and calculation of performance characteristics should be in accordance or consistent with the guidance given in ‘A Manual of Analytical Quality Control for the Water Industry’ (NS30).

A3.4 A laboratory using an analytical method which is not referenced to a fully validated authoritative method will be expected to demonstrate that the method has been fully documented and tested to the standard currently expected of an authoritative reference method. It should demonstrate that the following have been established:

(i) the required tolerances of all measurements undertaken within the method (volumes, temperatures, masses, etc.);

(ii) the forms of the determinand measured, including speciation;

(iii) the effect of interferences has been widely investigated and quantified; and

(iv) significant sources of error have been identified and adequate means of controlling them documented.

A3.5 Further guidance is given in section 4 of NS30. In the past some reference methods may have been validated to a lower standard than is now required by bodies such as the Standing Committee of Analysts. The data available plus the body of experience of use of these methods should be assessed when deciding whether the methods are suitable.
A3.6 For most parameters the minimum specification for the performance characteristics to be determined is as follows.

Estimate the within-laboratory total standard deviation of individual analytical results for blanks, standard solutions, samples and spiked samples on at least 5 separate days (further advice on number of batches and period of testing is given below). The number of replicate determinations of each solution in each batch should be the same and not less than two. The trueness for standard solutions, mean spiking recovery and standard deviation of spiking recovery should also be determined.

A3.7 The range of the standard solutions tested should include the regulatory prescribed concentration or value wherever possible, but in all cases the whole calibrated range of the method must be covered subject to allowance for ensuring that all measurements fall within the calibrated range. This implies that a minimum of two different standard solutions must be included in the performance tests. All standard solutions should be prepared immediately prior to analysis for each batch, either from the pure substance or a stock solution which is known to be stable for the period of the tests.

A3.8 All estimates of standard deviation used to estimate limit of detection or precision, or used in significance tests must have at least 10 degrees of freedom.

A3.9 The sample, or, if necessary, samples, and spiked sample(s) selected for use should represent the type or types of drinking water normally analysed. The same bulk sample(s) should be used throughout the tests. Samples should be spiked immediately before analysis for each batch. The spiking standard should either be known to be stable for the period of the tests or be prepared as for standard solutions.

A3.10 Where there is a choice of key instruments, including electrodes and chromatographic columns, each combination used should be regarded as a separate analytical method. In such cases the following guidance is given.

A3.11 For identical instruments full validation is required of each method except where the results of limited testing of the instruments under the conditions used in the analytical method have demonstrated that there is no statistically significant (at the 95% confidence level) difference in performance between the instruments, in which case only one method requires full validation. The tests should be performed on a minimum of five separate days and include the analysis of typical real samples and spiked samples. If the internal AQC record subsequently shows a significant difference in performance between methods each system should then be fully validated. Alternatively, independent data may be available to demonstrate the equivalence of items such as chromatographic columns.

A3.12 For instruments which are not identical full validation is required for each analytical method.

A3.13 Laboratories should note that 5 batches of duplicate analyses does not give 10 degrees of freedom. While many combinations of number and size of batch may give 10 degrees of freedom or more, a minimum of 11 batches is required to guarantee that number of degrees of freedom, irrespective of the number of replicates included in the batch. Laboratories are therefore strongly recommended to adopt 11 batches of duplicates as their minimum specification. The formula for calculating degrees of freedom is given on page 57 of NS30.
A3.14 For methods where the discrimination of the method is insufficient to record values other than zero for most blank determinations the within-batch standard deviation of either the low standard or the within-batch standard deviation of the sample may be used to calculate the limit of detection. Alternatively, a very low standard solution, at a concentration approximately two to three times the expected limit of detection when using the best currently available method, may be used as a surrogate blank. Similarly a natural sample spiked at a similar low level may, if necessary, be used as a surrogate natural sample. Some methods, particularly those involving simple titrations or the use of comparators, may be incapable of measuring any within-batch differences. In such cases the limit of detection should be quoted as the lowest measurable concentration or value.

A3.15 The bulk sample may not always be stable over the entire period of testing, resulting in an artificially high estimate of between-batch standard deviation. This instability may be recognised by a distinct trend in results for the sample over the period of testing and a between-batch standard deviation which, statistically, is significantly greater (at the 95% confidence level) than would be expected from the estimates obtained for the standard solutions. In such cases a surrogate between-batch standard deviation should be calculated using procedure (a) on page 53 of NS30. Where the instability is so great that the estimate of within-batch standard deviation is significantly affected it may be possible to improve stability by ageing of the sample. Where ageing is either impractical or ineffective in reducing sample instability sufficiently to avoid a statistically significant effect on the estimate of within-batch standard deviation, procedure (b) on pages 53 and 54 of NS30 should be used.

A3.16 The period of testing should be continuous and not unduly long. Not more than 2 batches may be analysed on any one day. When 2 batches are analysed on the same day all instruments used should be shut down to overnight conditions, daily reagents freshly prepared and all test solutions freshly prepared between the first and second batches.

A3.17 For physical parameters for which values are not truly additive spiking recovery tests may yield little useful information and need not be done. It is not possible to either analyse a blank or do spiking recovery tests for hydrogen ion. For these parameters the calibrated range (or ranges) must include the full range of values encountered and the PCV (the full PCV range for hydrogen ion), as samples cannot be diluted.

A3.18 In the following paragraphs re-evaluation means the investigation of the analytical system and its performance to determine whether the most recent validation or revalidation of the analytical system remains appropriate. Re-evaluation may include, as necessary, assessment of the cumulative effect of minor changes to the analytical method, review of internal and external AQC and corrective action followed by limited testing to demonstrate that correct performance has been re-established.

A3.19 In the following paragraphs revalidation means the redetermination of the performance characteristics of the analytical system as described above.

A3.20 The performance characteristics of an analytical method should be revalidated whenever a significant change has occurred such as a change in:

(i) the analytical procedure used;

(ii) the key equipment used;
(iii) the laboratory environment; or

(iv) change of staff carrying out the procedure. This does not include routine changes which normally occur within the laboratory which are supported by appropriate training and properly trained supervisors.

A3.21 The significance of any change should be assessed by a competent analyst, and any decision that a change is not significant supported by the results of limited but adequate testing.

A3.22 When a change of premises occurs it is not always possible to revalidate all analytical methods before they are used. In such cases it is essential that methods which on transfer also undergo a change of one of the types (i), (ii) and (iv) above are revalidated before they are used, as should those which are known to be susceptible to changes in laboratory environment e.g. ammonium and trihalomethanes. Other analytical methods should normally be revalidated within 3 months of relocation.

A3.23 Analytical methods should also be re-evaluated and if necessary revalidated whenever the results of routine AQC (internal or external) indicate that a statistically significant deterioration in performance has occurred which cannot be corrected, or that there is a significant discontinuity in the routine AQC record, whether due to a failure to perform routine AQC or disuse of the analytical method. Laboratories may also wish to re-evaluate the performance characteristics whenever routine AQC indicates that a statistically significant improvement in performance has occurred. Statistical significance should normally be assessed at the 95% confidence level.

A3.24 Analytical methods which are used infrequently should not require full revalidation when they are used provided a greater degree of internal AQC is employed than that recommended for routinely used systems. A suitable procedure is given in recommendation (iv) of the Harmonised Guidelines for Internal Quality Control in Analytical Chemistry Laboratories ISO/IUPAC/AOAC, Pure and Applied Chemistry, vol 67, No 4, pp 649-666, 1995 (The AQC Guidelines).

A3.25 When an analytical method has been in continuous use for several years, typically between 3 and 5 years without revalidation, the system should be re-evaluated, and the need for revalidation of the performance characteristics considered.

A4 Routine Internal AQC

A4.1 As a minimum, the laboratory should use a control solution that contains a known concentration at or close to the PCV for each parameter or determined constituent of a parameter for each analytical method, except as provided for below. The term "close to the PCV" should be interpreted as meaning the PCV ± 25%. The PCV for a determined constituent of a parameter is the PCV for the parameter. The frequency of use of control solutions must be at a frequency of >5% of samples and subject to a minimum of one per batch of analyses for batches of less than 20 samples. All control solutions should be subject to the full analytical procedure that is used for analysing samples and analysed with each batch of analyses.

A4.2 For permanent laboratory tests a "batch of analyses" should be regarded as a group of measurements or observations of standards, samples and/or control solutions which
have been performed together in respect of all procedures, either simultaneously or sequentially, by the same analysts using the same reagents, equipment and calibration.

A4.3 For field tests a "batch of analyses" should be regarded as a group of measurements or observations of standards, samples and/or control solutions which have been performed on the same day by the same analysts using the same reagents, equipment and calibration.

A4.4 In the following cases the guidance on selection of control solutions given above is not appropriate:

(i) the PCV represents a concentration or value outside the normal analytical range of a particular method;

(ii) there is no PCV;

(iii) the PCV is descriptive;

(iv) the PCV is a minimum; or

(v) the PCV is a range.

A4.5 In these cases, as a minimum, a control solution with a known concentration or value within both the calibrated range of the method and the range of interest should be used.

A4.6 When a wide range of concentrations or values is calibrated which includes the PCV but the overwhelming majority of drinking water samples have concentrations or values which are within a narrow band of the calibration range for which control at the PCV is inappropriate, as a minimum two control solutions should be used, one with a known concentration or value at or close to the PCV and the other with a known concentration or value within the range of interest.

A4.7 As a minimum, all the results obtained from all control solutions should be used to plot, for each solution or calculated quality control characteristic, a Shewhart chart which is used to decide whether a method is in statistical control. When other types of chart are used, including those using statistics calculated from individual values, the laboratory or other organisation should demonstrate that its arrangements effect adequate statistical control over the systematic error, and both the within-batch and between-batch components of random error, though not necessarily as separate items.

A4.8 Further guidance on the construction and use of control charts is given in NS30, the AQC Guidelines and “Guidance on the Interpretation of Aspects of Analytical Quality Control (AQC)” which is available from the Drinking Water Inspectorate.

A4.9 The laboratory or other organisation should have properly documented policy and procedures for routine AQC that stipulate what action or actions should be followed when an out of control condition is shown to exist, include a definition of an out of control condition and detail the records to be made when such a condition exists. These documents should be consistent with the guidance given in the documents referenced above. The results of analyses obtained using a method not in statistical control should not be released except in exceptional circumstances, when each result so released should carry an appropriate commentary in all records and reports. The circumstances in which such results can be released should be fully documented and state that the cause of the out of control condition should first be identified and shown not to affect the results of analysis of samples intended for release.
A4.10 The procedures should also include regular and frequent examination and review of all charts and include guidance for checking and investigating significant trends or changes in either random or systematic error, and for correct operation of the chart. The minimum examination and review periods for each chart should depend on the frequency with which datum points are produced but should not be less frequent than monthly for examination and annually for review. The examination and review should be carried out by a suitably qualified and competent person who is not directly involved in the analysis, such as the laboratory quality manager. There should be appropriate rules for assessing revised control limits.

A5 External AQC

A5.1 The laboratory should participate in an appropriate external AQC scheme for each parameter or determined constituent of a parameter for which an appropriate scheme is available. The laboratory should also have a properly documented procedure for investigating and recording all failures notified by the organiser of a scheme.


A5.3 In line with the recommendations of this document laboratories are recommended to participate in schemes distributing drinking water samples of appropriate matrix and which conform to the relevant parts of the protocol. Samples should contain or be spiked with concentrations of interest (approximate range PCV/10 to twice the PCV) and with appropriate speciation where this is of interest. When, in respect of any parameter, a laboratory participates only in schemes which do not meet all the recommended criteria it will be expected to demonstrate that it is participating in the most appropriate scheme currently available.

A6 Regulation 16(3)

A6.1 This regulation includes any organisation or person carrying out regulatory analysis in the definition of a laboratory. This includes all analyses carried out as field tests. Advice on the use of on line monitors is included above at paragraphs 19.13-19.19.

A7 Regulation 16(4) Retention of records

A7.1 This regulation requires a water company to make and retain all records necessary to establish that all the requirements of regulation 16 have been complied with in respect of each analysis carried out.

A7.2 The records required include:

(i) instrument installation, commissioning, maintenance and repair records, including any instrument log or diary;

(ii) basic calibration records (including proof of traceability), system suitability checks and any other record necessary to demonstrate the suitability of any equipment used at the time of the analysis;

(iii) the analytical procedure used;
(iv) method performance testing data, including raw data and a full record of any re-evaluation of the method;

(v) routine internal and external AQC data, including charts, investigations of out of control conditions and corrective action; and

(vi) raw data for the whole analytical run.

A7.3 Items (i) and (ii) above should be retained for not less than three years after the equipment has been decommissioned and disposed of. Calibration records should be retained for not less than three years after either disposal of the equipment or disposal of the calibration item, whichever is the longer.

A7.4 Items (iii) and (iv) above should be retained for not less than three years after the last analysis to which they relate.

A7.5 Items (v) and (vi) above should be retained for not less than three years.

A8 Regulation 16(5)

A8.1 This regulation sets the required standard for quality of analysis or, in the case of microbiological parameters, the method to be used.

Microbiological parameters

A8.2 Sub-paragraph (a) requires that the methods specified in column (2) of Table A1 in Schedule 4 must be used, unless an alternative has been approved. See regulations 16(7) to 16(11) below.

Hydrogen ion

A8.3 All pH measurements must have a trueness of 0.2 pH units and a precision of 0.2 pH units. Suitability of any analytical method used must be established before it is used to analyse samples. See Initial performance testing above. On commencement of use, the analytical method must then be continuously subject to routine internal and external AQC. See Routine Internal AQC and External AQC above.

Odour and Taste

A8.4 A method with a precision of 1 dilution number at 25°C must be used.

A8.5 Methods A1-A3 respectively in the publication The Determination of Taste and Odour in Drinking Waters (2010) in the series Methods for the Examination of Waters and Associated Materials should be used. Performance characteristics cannot be determined for these parameters, nor is there currently available a suitable scheme of external AQC. One sample, which is expected to have a dilution number greater than zero, should be analysed in duplicate with each batch of samples put through the full procedure. The difference between the two results should be plotted on a control chart and used to provide information precision of analysis of samples. All out of control conditions should be investigated and appropriate action taken. Further advice on the use of difference control charts is given in section 5.3.3 (pages 59 to 70) of NS30.
Parameters with no PCV or a descriptive PCV only

A8.6 The parameters residual disinfectant (free and/or total chlorine) and total organic carbon have no numerical value for the PCV and therefore do not appear in Table 2 in Schedule 4. The general guidance given below for all other parameters is appropriate, but satisfactory target values for limit of detection, precision and trueness need to be set by the laboratory. This should be done on the basis of fitness for purpose. Unless the water company is able to demonstrate that less stringent targets are appropriate the target values given below will be regarded as describing fitness for purpose for these parameters.

(i) Residual Disinfectant:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trueness</td>
<td>The greater of 10% of the result or 0.05 mg Cl/l</td>
</tr>
<tr>
<td>Precision</td>
<td>The greater of 10% of the result or 0.05 mg Cl/l</td>
</tr>
<tr>
<td>Limit of Detection</td>
<td>0.05 mg Cl/l or the minimum concentration specified as either a target value or an action level at any of the water company’s treatments works or in its distribution system, whichever is the lower concentration.</td>
</tr>
</tbody>
</table>

Guidance on calibration and AQC for chlorine measurement is given in Information letter 03/2005.

(ii) Total organic carbon (TOC)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trueness</td>
<td>The greater of 10% of the result or 0.25 mg C/l</td>
</tr>
<tr>
<td>Precision</td>
<td>The greater of 10% of the result or 0.25 mg C/l</td>
</tr>
<tr>
<td>Limit of Detection</td>
<td>0.5 mg C/l</td>
</tr>
</tbody>
</table>

All other parameters

A8.7 The performance requirements are given in Table A2 in Schedule 4 in terms of the maximum permitted deviation of the method for trueness and precision and the maximum value for the limit of detection. These terms are defined in regulation 16(6). For the purposes of these regulations, the precision quoted is numerically equal to twice the total within laboratory standard deviation of individual results.

A8.8 Methods that measure the parameter as defined and are capable of achieving the stated performance should be selected. Due regard must be given to the effect of interferences. In general, the methods published by the Standing Committee of Analysts in the series ‘Methods for the Examination of Waters and Associated Materials’ will be capable of the required performance, but laboratories should ascertain this before using any particular method.

A8.9 A laboratory using an analytical method which is not referenced to a fully validated authoritative method will be expected to demonstrate that the method has been fully documented and tested to the standard currently expected of an authoritative reference method. It should demonstrate that the following have been established:

(i) the required tolerances of all measurements undertaken within the method (volumes, temperatures, masses etc.);
(ii) the forms of the determinand measured, including speciation;
the effect of interferences has been widely investigated and quantified; and

significant sources of error have been identified and adequate means of controlling them documented.

A8.10 Further guidance is given in section 4 (pages 31 to 48) of NS30. In the past some reference methods may have been validated to a lower standard than is now required by bodies such as the Standing Committee of Analysts. The data available plus the body of experience of use of these methods should be assessed when deciding whether these methods are suitable.

A8.11 Table A2 in Schedule 4 only specifies precision and trueness at the PCV. At other concentrations or values the requirement is either the percentage figure given in Table A2 or one half of the value or concentration represented by that percentage figure at the PCV, whichever is the larger.

A8.12 For example, for aluminium the trueness and precision requirements are 10% at the PCV (200 μg/l). This equates to an absolute value of 20 μg/l at the PCV. The target for concentrations less than 100 μg/l (one half of the PCV) is one half of this, 10 μg/l (standard deviation 5 μg/l). For all concentrations above 100 μg/l the target is 10% of the result (standard deviation 5%). At one half of the PCV the target is the same whichever way it is calculated. A worked example for bromate is given below.

### Worked example for the bromate parameter

<table>
<thead>
<tr>
<th>Limit of Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target 25% of PCV i.e. for bromate 2.5 ug/l</td>
</tr>
</tbody>
</table>

Calculated as 5 x within batch SD for blank or low standard surrogate blank or 3 x within batch SD of a natural sample or low spiked sample.

### Precision

Target the greater of 25% of mean result or 25% of 0.5 x PCV i.e. for bromate 25% of mean or 1.25ug/l

This applies to all solutions

### Trueness

(i) Standards

Greater of 25% of true value or absolute target of 25% of 0.5 x PCV i.e. for bromate 25% of prepared value or 1.25 ug/l

(ii) Natural samples

Not applicable

(iii) Spiked natural samples

Mean recovery of spike the greater of 25% of added spike or 25% of 0.5 x PCV i.e. for bromate 25% of added spike or 1.25 μg/l
A8.13 The suitability of any analytical system used must be established before it is used to analyse samples. See Initial performance testing above. On commencement of use, the analytical system must then be continuously subject to routine internal and external AQC. See Routine Internal AQC and External AQC above. Guidance on the suitability of methods for the preparation of samples for analysis of metals, sample and sample extract preservation and storage requirements is given in Information letter 12/2005.

A8.14 Performance of a method is satisfactory if either all the relevant criteria are met for all solutions or any difference between the target and the estimate is not significant at the 95% confidence interval.

A9 Regulation 16(6)

A9.1 This regulation defines the terms ‘limit of detection’, ‘precision’ and ‘trueness’.

A9.2 Either of the methods of estimating the ‘limit of detection’ given may be used. The estimate of standard deviation used must be calculated from the initial performance testing data using ANOVA. An F-test may be used to determine whether a failure to achieve the target limit of detection is statistically significant.

A9.3 ‘Precision’ is twice the total within laboratory standard deviation. It must be calculated from the initial performance testing data using ANOVA. An F-test may be used to determine whether a failure to achieve the target precision is statistically significant.

A9.4 ‘Trueness’ must be determined using the calculated value of a standard solution or added spike as the true value, and the mean value calculated from the initial performance testing data using ANOVA. A t-test may be used to determine whether a failure to achieve the target trueness is statistically significant, provided precision is satisfactory.

A10 Use of Reporting Limits instead of the limit of detection

A10.1 Analytical reporting limits (RLs) are values or concentrations, other than limits of detection (LODs), that are used by laboratories, and sometimes Water Companies, as a cut off below which all results for a particular test are reported as being less than that value or concentration. They should not be used for parameters that are defined as the sum of the detected concentrations of the constituent compounds, e.g. total pesticides, trihalomethanes, polycyclic aromatic hydrocarbons.

A10.2 RLs are sometimes used instead of the determined LODs because the LOD has a value or concentration that is not compatible with the laboratory’s or company’s policy on reporting results because it has more significant figures than are reported. This practice is only acceptable if the RL adopted is the LOD rounded up to the last reporting figure, and the RL is only applied to the final calculated result (including any conversion to regulatory units). Examples of acceptable and unacceptable RLs are given below.
Examples of inappropriate use of reporting limits

<table>
<thead>
<tr>
<th>LOD</th>
<th>Maximum permissible LOD</th>
<th>RL ¹,²</th>
<th>Reason given for adopting RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.31</td>
<td>2.5</td>
<td>2.5</td>
<td>Equals maximum permissible LOD and will not need revising if LOD changes</td>
</tr>
<tr>
<td>0.65</td>
<td>1</td>
<td>2</td>
<td>Set as a common RL for all determinands in the analysis suite</td>
</tr>
</tbody>
</table>

¹ Using these RLs on the public record instead of the actual result of analysis would contravene the reporting requirements.

² Applying these RLs to intermediate results (e.g. to nitrite and total oxidised nitrogen results before calculating the nitrate result) would contravene the requirements of regulation 16. The calculation is part of the analytical method.

Examples of appropriate use of reporting limits

<table>
<thead>
<tr>
<th>LOD</th>
<th>Number of decimal places reported for results close to the LOD ³,⁴</th>
<th>Appropriate RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.141</td>
<td>3</td>
<td>0.141</td>
</tr>
<tr>
<td>0.141</td>
<td>2</td>
<td>0.15</td>
</tr>
<tr>
<td>0.141</td>
<td>1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

³ The number of decimal places reported should always be related to method performance.

⁴ The examples of number of decimal places reported are given for demonstration of appropriate reporting limits only and do not reflect any view on the appropriate number of significant figures to report.

A11 Regulations 16(7) to 16(11)

A11.1 Where a method of analysis is specified in Table A1 in Schedule 4, the prescribed method, laboratories must use the specified method unless an alternative method has been authorised (approved), in which case the authorised alternative may be used subject to any conditions given in the authorisation. An alternative method may not be used until written authorisation has been given to the appropriate water company.

A11.2 A laboratory wishing to use an alternative method that has not been approved must first make an application, through the relevant water company, for authorisation of the method. Such application must be made in writing to the Drinking Water Inspectorate and must include a full description of the method to be used along with results of tests demonstrating both the reliability of the method and its equivalence to the prescribed method.

A11.3 More detail of the information and testing requirements and criteria are given in ‘The Microbiology of Drinking Water. An expert group of microbiologists from Member States is to be established to provide advice to the Commission on technical issues such as performance testing of alternative microbiological methods.

A11.4 An alternative method will only be authorised if it is adequately documented and the results of tests demonstrate to the Drinking Water Inspectorate’s satisfaction that
results obtained using the method are at least as reliable as those produced by the use of the prescribed method.

A11.5 The Drinking Water Inspectorate may make any authorisation subject to such conditions as it considers appropriate, e.g. limitation of the types of sample matrix it may be used to analyse or specify extra quality control requirements. Authorisation may be general or granted to a specific water company. It may also be revoked at any time, by notice in writing to any water company to which authorisation has been given. At least three months’ notice will be given of any revocation.

A12 Additional Information

A12.1 In addition to the guidance given above and in the documents referenced in the Annex and the Introduction to the Guidance, advice on different aspects of AQC is given in a number of other documents, many of which are referenced within the reference documents. Further sources of relevant information are:

- ‘Guidelines for Calibration in Laboratories’, which is available on www.dwi.gov.uk.
- “Guidance On The Interpretation Of Aspects Of Analytical Quality Control (AQC)”
- "The Determination of Taste and Odour in Drinking Waters 2010" in the series Methods for the Examination of Waters and Associated Materials (HMSO)
- “The Microbiology of Drinking water 2002” and relevant updates in the series Methods of Examination of Waters and Associated Materials. (http://www.environment-agency.gov.uk/nls)
APPENDIX 2: RADIOACTIVITY SAMPLING AND ANALYSIS

1. Decision Tree for Radioactivity Monitoring
(Refer also to Guidance above under regulation 6A and regulation 19)

Risk assessment/monitoring has identified a likely source of radioactivity – tritium, radon or Indicative Dose

- Monitor gross alpha & gross beta, radon, tritium as applicable
- Natural source?
  - Yes: Monitor gross alpha & gross beta, radon, tritium as applicable
  - No: Criteria exceeded for gross alpha, gross beta or specified value for radon or tritium?
    - No: Specified value exceeded or is likely to exceed?
      - No: Regulation 6A(3) Notice
      - Yes: Monitor individual radionuclides
    - Yes: Monitor individual radionuclides

- Criteria exceeded for gross alpha, gross beta or specified value for radon or tritium?
  - No: Specified value exceeded or is likely to exceed?
    - No: Audit monitoring required
    - Yes: Activity Levels are stable?
      - No: Regulation 6A(3) Notice
      - Yes: Regulation 6A(7) Notice
  - Yes: No

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2. Indicative Dose Screening and Investigation – more detail

For each WTW assess the likely presence of artificial or enhanced natural levels of radionuclides (geology, hydrology, information from EA on permitted discharges, historical data)

Determine gross alpha and gross beta levels as part of routine monitoring program.

Are the criteria for gross alpha (0.1Bq/l) or gross beta (1.0Bq/l) exceeded?

Check validity of measurement obtained.

Collect further samples every few days (at least once a week) for a month.

Criteria still being exceeded?

Audit Monitoring required

Does ID exceed 0.1mSv?

Naturally derived & stable?

No intervention needed, continue sampling as normal.

Consider applying for a Reg. 6A(3) Notice

Consider applying for a Reg. 6A(7) Notice

Consider applying for a Reg. 6A(3) Notice

Carry out monitoring for specific radionuclides to determine Indicative Dose. Refer to Schedules 3A & 5 of the Regulations, and DWI Guidance

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3. Common isotopes and sources – an aid to risk assessment

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nuclide</th>
<th>Derived concentration (Bq/l)</th>
<th>Half life</th>
<th>µg/l</th>
<th>Uses</th>
<th>Emits</th>
<th>WHO guideline limits µg/l as the element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural</td>
<td>U-238</td>
<td>3.0</td>
<td>4.468x10⁹y</td>
<td>241.2</td>
<td>Formerly used in self-luminous paints for watches, nuclear panels, aircraft switches, clocks, and instrument dials. Used as a radiation source in some industrial radiography devices to check for flawed metallic parts.</td>
<td>alpha and gamma</td>
<td>30</td>
</tr>
<tr>
<td>Natural</td>
<td>U-234</td>
<td>2.8</td>
<td>2.455x10⁹y</td>
<td>0.0121</td>
<td></td>
<td>alpha and gamma</td>
<td>30</td>
</tr>
<tr>
<td>Natural</td>
<td>Ra-226</td>
<td>0.5</td>
<td>1600y</td>
<td>1.37x10⁵</td>
<td></td>
<td>alpha and gamma</td>
<td></td>
</tr>
<tr>
<td>Natural</td>
<td>Ra-228</td>
<td>0.2</td>
<td>5.75y</td>
<td>1.98x10⁸</td>
<td>Used as a tracer for the behaviour of heavy metals in the soil-stream-estuary system.</td>
<td>beta</td>
<td></td>
</tr>
<tr>
<td>Natural</td>
<td>Pb-210</td>
<td>0.2</td>
<td>22.23y</td>
<td>7.06x10⁸</td>
<td></td>
<td>alpha, beta and gamma</td>
<td>10</td>
</tr>
<tr>
<td>Natural</td>
<td>Po-210</td>
<td>0.1</td>
<td>138.38d</td>
<td>3.53x10⁸</td>
<td></td>
<td>alpha and gamma</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>C-14</td>
<td>240</td>
<td>5700y</td>
<td>1.45x10⁸</td>
<td></td>
<td>beta</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>Sr-90</td>
<td>4.9</td>
<td>28.80y</td>
<td>9.59x10⁷</td>
<td>In industry as a radioactive source for thickness gauges. Heat source for electric power. Radiotherapy</td>
<td>beta</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>Pu239/Pu-240</td>
<td>0.6</td>
<td>2.41x10⁴y/6 561y</td>
<td>2.61x10⁴/7.14x10⁵</td>
<td>Power and heat source</td>
<td>alpha and gamma</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>Am-241</td>
<td>0.7</td>
<td>432.6y</td>
<td>5.52x10⁶</td>
<td>Commonly used in smoke detectors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

³These precise values are calculations for a dose of 0.1mSv as an annual intake of 730 litres and taken from Euratom dose coefficients from Annex III, Table A of Directive 96/29/Euratom. Other radionuclides can be calculated using this basis, additionally, more up to date information may be used to update this information.
<table>
<thead>
<tr>
<th>Origin</th>
<th>Nuclide</th>
<th>Derived concentration (Bq/l)³</th>
<th>Half life</th>
<th>µg/l</th>
<th>Uses</th>
<th>Emits</th>
<th>WHO guideline limits µg/l as the element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial</td>
<td>Co-60</td>
<td>40</td>
<td>5.27y</td>
<td>9.55x10⁻⁷</td>
<td>Radiotherapy</td>
<td>gamma</td>
<td>beta and gamma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Industrial radiography</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Food irradiation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>Cs-134</td>
<td>7.2</td>
<td>2.064y</td>
<td>1.50x10⁻⁷</td>
<td>beta and gamma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>Cs-137</td>
<td>11</td>
<td>30.05y</td>
<td>3.42x10⁻⁶</td>
<td>Medical radiation therapy devices for treating cancer.</td>
<td>beta</td>
<td>gamma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Industrial gauges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>I-131</td>
<td>6.2</td>
<td>8.023d</td>
<td>1.34x10⁻⁹</td>
<td>Medical radiotherapy</td>
<td>beta</td>
<td>gamma</td>
</tr>
</tbody>
</table>

This is not an exhaustive list, but represents the most common isotopes associated to radioactivity sources.
4. Analytical requirements

These are taken directly from Schedule 4 of the Regulations and collated into a single table. In the absence of DWTS for radioactivity parameters, the analytical methods should be covered by ISO 11929.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit of Detection (Bq/l)</th>
<th>PCV (Bq/l)</th>
<th>Action (Bq/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tritium</td>
<td>10</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Radon</td>
<td>10</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>alpha</td>
<td>0.04</td>
<td>0.1</td>
<td>0.5*</td>
</tr>
<tr>
<td>beta</td>
<td>0.4</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>U-238</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-234</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ra-226</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ra-228</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb-210</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Po-210</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-14</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sr-90</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pu-239/Pu-240</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Am-241</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-60</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cs-134</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cs-137</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-131</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This is WHO Guideline Value (GV), which may be set as the limit (screening level), if required, through the Notice procedure where ID is shown to be below 0.1mSv, authorised by the Inspectorate. In order operate with this screening level, the company will be required to provide radionuclide identification as evidence to support a relaxation of the gross alpha screening level.

5. Methods of analysis

Below are the published methods of analysis for radioactive parameters. This list is not exhaustive, but these methods provide starting points for in-house methods and are under constant review through either the Standing Committee of Analysts (SCA) or British Standards Institute (BSI). Analytical methods for radionuclides fall under the general DWTS requirements for analysis and accreditation.

Blue book methods of analysis (current 21/12/15)
3. The determination of tritium (tritiated water) activity concentration by alkaline distillation and liquid scintillation counting 1999 (173).
4. Guidance on the measurement of tritium in environmental samples 2005 (198).
British Standards (current 21/12/15)


2. BS EN ISO 10703:2015 Water quality. Determination of the activity concentration of radionuclides. Method by high resolution gamma-ray spectrometry


10. BS EN ISO 13160:2015 Water quality. Strontium 90 and strontium 89. Test methods using liquid scintillation counting or proportional counting


15. BS ISO 13168:2015 Water quality. Simultaneous determination of tritium and carbon 14 activities. Test method using liquid scintillation counting

16. BS ISO 13165-3 Water quality - Radium-226 - Part 3 Test method using coprecipitation and gamma-spectrometry Shortcut

17. BS…17294-2 Water quality — Application of inductively coupled plasma mass spectrometry (ICP-MS) - Part 2 Determination of selected elements including uranium isotopes
6. Decay Pathways

Decay pathways provide useful information to assist water companies in the process of identifying sources, or risks from radionuclides. It is advised that water companies review the radionuclide and its decay pathway to inform the risk assessment and to provide vital information regarding the stability of the radionuclide(s), to ensure that analysis is carried out without degradation to the sample and is representative of the water supplied. 30 day stability is not an absolute and some radionuclides have a considerably shorter half-life than 30 days. The chart below is an example of a decay pathway, in this case naturally occurring uranium, which includes radon.

![Natural radioactivity decay – Uranium to Lead](chart)