



DRINKING WATER INSPECTORATE

The Water Supply (Water Quality) Regulations (Northern Ireland) 2002

Interim Guidance



April 2005

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INTRODUCTION

- 1 This document provides guidance on the implementation of The Water Supply (Water Quality) Regulations (Northern Ireland) 2002 (SR 331) and The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2003 (SR 369) which apply to the public supplier of water in Northern Ireland, Water Service, an agency within the Department for Regional Development. It is based on the Guidance Document prepared by the Drinking Water Inspectorate for England and Wales in support of The Water Supply (Water Quality) Regulations 2000, The Water Supply (Water Quality) (Amendment) Regulations 2001 and The Water Supply (Water Quality) Regulations 2001. Unless otherwise specified, reference within this document to the ‘Regulations’ means The Water Supply (Water Quality) Regulations (Northern Ireland) 2002 and The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2003.
- 2 The Drinking Water Inspectorate (DWI) exercises the powers and duties of the Minister for the Department of Environment in Northern Ireland. The Drinking Water Inspectorate is a unit within Environment and Heritage Service, an agency within the Department of Environment (DoE).
- 3 The Guidance comes into effect in line with the coming into force of the various regulations:

Guidance on regulations 2, 27, 28 and 36	28 November 2002
Guidance on regulations 3 and 37	1 June 2003
Guidance on regulations 4 and 17 to 24, 29(4) and (5), and 38(1)	25 December 2003
Guidance on all other regulations	1 January 2004
- 4 This is the first edition of the Guidance. It does not purport to offer any authoritative interpretation of the Regulations. It is recognized that it may contain omissions, and that some advice will need to be modified or updated as more experience is gained with implementing the new Regulations or further guidance is published by the European Commission.

The next paragraph will only apply in the final version of the document. DWI welcomes comments on all aspects of the Guidance Document, the master copy has been placed on the Drinking Water Inspectorate’s website: <http://www.ehsni.gov.uk/environment/drinkWater/links.shtml> Only that version will receive any periodic updates; Water Service will be notified by e-mail of any changes to the document.

5 Regulatory Framework

The following provide the regulatory framework for public drinking water supplies in Northern Ireland:

- Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption (European Drinking Water Directive) – sets standards for drinking water quality.
- The Water and Sewerage Service (Northern Ireland) Order 1973 and the Water and Sewerage Services (Amendment) (Northern Ireland) Order 1993 (SI 3165) – the primary legislation which allow the Regulations to be made.
- The Water Supply (Water Quality) Regulations (Northern Ireland) 2002 (SR 331) and The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2003 (SR 369) - the legislation which transposes the Drinking Water Directive (98/83/EC) requirements.
- The Food Safety (General Food Hygiene) Regulations (Northern Ireland) 1995 (SR 360) and The Food Safety (General Food Hygiene) Amendment Regulations (Northern Ireland) 2004 (SR 290) – the legislation which transposes the Directive with respect to water used for food production.

6 Associated Regulations and Related Guidance

- The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations (Northern Ireland) 1996 (SR 603).
- The Water Regulations (Northern Ireland) 1991 (SR 50).
- The Private Water Supply Regulations (Northern Ireland) 1994 (SR 237).
- Private Water Supplies Circular 24/91 (former Department of the Environment) and circular 68/91 (former Welsh Office).
- The Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations (Northern Ireland) 1999 (SR 301) and the Natural Mineral Water, Spring Water and Bottled Drinking Water (Amendment) Regulations (Northern Ireland) 2003 (SR 182).
- The Microbiology of Drinking Water Supplies (2002) in the series 'Methods for the Examination of Water and Associated Materials', published by the Standing Committee of Analysts.
- Principles of Water Supply Hygiene and Technical Guidance Notes (Water UK 1998).

- Guide to the Microbiological Implications of Emergencies in Water Services (Water Authorities' Association 1985).
- 'General Principles of Sampling and Accuracy of Analytical Results' in the 'Methods for the Examination of Water and Associated Materials' published by the Standing Committee of Analysts.
- Guidance for the Monitoring of *Cryptosporidium* in Treated Water Supplies in Northern Ireland (2003) which includes Standard Operating Protocols for the Monitoring of *Cryptosporidium* Oocysts. A copy of this document is available on the website: www.ehsni.gov.uk/environment/drinkWater/links.shtml
- Drinking Water Inspectorate for England and Wales Information Letters: 12/2000 and 3/2001 which are incorporated in DWI NI letter of 15 February 2001.
- Asbestos and Drinking Water – former Department of the Environment/Welsh Office letter dated 20 February 1986 to Chief Executives of Water Authorities in England and Wales (DoE ref: WS/602/78). A copy of this letter is available in the HMSO document "Guidance on Safeguarding the Quality of Public Water Supplies" ISBN 0 11 752262 7.
- DWI England and Wales - Interim Guidance on The Water Supply (Water Quality) Regulations 2000 and 2001 available on the website: www.dwi.gov.uk/regs/regulations.shtm
- Guidelines for Calibration in Laboratories, available on the Drinking Water Inspectorate for England and Wales website: www.dwi.gov.uk

7 Definition of Health Authority

Where this Guidance refers to a 'health authority' this is defined as the relevant Consultant(s) in Communicable Disease in the Department of Health, Social Services and Public Safety.

- 8** Water Service may enter into alternative local reporting arrangements with health authorities with the written agreement of the parties identified above. Such arrangements should be reviewed regularly.

PART I

GENERAL

Regulation 2 - Interpretation

Definitions – Regulation 2(1) Meaning of Relevant Metabolites

1.1 The Regulations set the following standards for pesticides and related products:

- aldrin 0.03µg/ l
- dieldrin 0.03µg/ l
- heptachlor 0.03µg/ l
- heptachlor epoxide 0.03µg/ l

- other pesticides 0.10µg/ l

- total pesticides 0.50µg/ l

1.2 Pesticides and related products are defined as any organic insecticide, herbicide, fungicide, nematocide, acaricide, algicide, rodenticide, slimicide 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. No guidance has yet been issued by the European Commission, but until it is, DWI considers that, in respect of drinking water, there is no evidence at the present time that any pesticide metabolites, degradation or reaction products represent a risk to health and, therefore, no additional monitoring is required. This Guidance Document will be updated in the light of EC guidance on the definition and interpretation of related products and relevant metabolites, degradation and reaction products as it may apply to the EC Drinking Water Directive.

1.3 The standard for other pesticides applies to each individual pesticide, also including any *relevant* metabolite, degradation and reaction product. Total pesticides means the sum of the detected concentrations of the individual pesticides 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 recognizes 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.

PART II

WATER SUPPLY ZONES

Regulation 3 – Identification of Water Supply Zones

Delineation and Designation of Water Supply Zones

- 2.1 Regulation 3 came into force on 1 June 2003. Regulation 3(1) requires Water Service 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 designation of the water supply zone should not change through the year.
- 2.2 DWI requires that designation is made by estimated resident population only. Water supply zone population estimates can be made from census information, district council updates, recorded number of connections and average occupancy figures. (Aim to get delineation as close as possible using wards and adjust appropriately around the boundaries using the other information to designate portions of a ward to an adjacent water supply zone if uniformly populated.)
- 2.3 In the last quarter of each calendar year, Water Service should review the designation of its water supply zones to ensure that the delineation remains appropriate, and assess revised estimated populations. The population estimates for water supply zones should relate to permanent residents only. During the review, Water Service should identify any water supply zone where the revised estimate of resident population supplied exceeds 100,000. Regulation 3(2) and (3) provide that the delineation of such zones should be revised to produce zones with a population below 100,000 in the following year. In general, the number of changes to the designation of water supply zones should be kept to a minimum.
- 2.4 A consistent approach is needed in the delineation of water supply zones. Water Service should, therefore, first identify which areas are supplied from single sources. A source could be the outlet of a water treatment works, a pumping station, a blending point or a service reservoir. A discrete area supplied from a single source should always be recorded as a single water supply zone unless it supplies more than 100,000 people. In such circumstances, the area should be subdivided into water supply zones, each with a population of less than 100,000.
- 2.5 The purpose of supply zone delineation is to identify areas of supply which do not have significant differences in water quality. The water quality indicated by sampling within the supply zone should be generally representative of the water quality supplied to the whole area of the zone. It is recognized that in some instances, the water quality indicated by a sample taken from the tap may be influenced by the domestic distribution system within a consumer's property.
- 2.6 Any discrete area whether supplied by one or more sources should be subdivided into separate supply zones if there are, or could be, significant differences in

water quality within the area. Water Service should also take into account the type of source, and only designate supply zones supplied by similar sources within the same water supply zone. Each supply zone would normally be served by an individual service reservoir or water tower, pumping or booster station or would be distinguished as a discrete pressure zone or by other appropriate features of the distribution system.

- 2.7 In areas where the variations in water quality are complex, or where the water supplied may be from a number of potential sources via transfer mains, the water supply zone should be delineated by reference to convenient geographical boundaries or by areas served by appropriate features of the distribution system.
- 2.8 Water Service has delineated its supplies into district metered areas, which under normal operation, have a single supply inlet. In such circumstances, water supply zones should consist of related district metered areas which are supplied from common sources.
- 2.9 It is recognized that Water Service may have to take temporary operational actions to maintain water supplies that may involve the introduction of water from sources not designated for that supply zone. Such temporary measures should not influence the annual designation of water supply zones. If permanent changes to the predesignated names and areas have to be made during the year, Water Service should notify the Inspectorate of the changes made.

PART III

WHOLESOMENESS

- 3.1 Part III (regulation 4) prescribes standards for wholesomeness in respect of water supplied by Water Service, for cooking, drinking, food preparation and washing and other domestic purposes, and to premises for food production purposes. In particular, regulation 4 provides that water is 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, minimum concentration or value (PCV). Some of the PCVs are specified in regulation 4, but more are included in Tables A and B of Schedule 1 to the Regulations.

Regulation 4(3) - Definition of Consumer's Tap

Definition of Consumer's Tap

- 3.2 The Regulations implement EC Directive 98/83/EC on the quality of water intended for human consumption. The Directive's standards must be complied with. In the case of water supplied from a distribution network, this is at the point within premises or an establishment at which the water emerges from the taps that are normally used for human consumption. Water Service is not responsible for any deterioration in water quality that may arise as a result of the domestic distribution system (with the exception of plumbing metals [copper and lead] where specific regulations apply).
- 3.3 Regulation 4(3) states that the standards for wholesomeness are to be complied with at the consumer's tap except in the case of water supplied from a tanker. Part IV of the Regulations requires monitoring at sampling points and other points to establish whether the water supplied meets the standards for wholesomeness. A sampling point is defined in regulation 2 as being a consumer's tap that is selected for monitoring purposes. Further guidance will be issued regarding monitoring within public buildings.
- 3.4 The consumer's tap is not defined in the Regulations. Water Service should assume that the consumers' taps to be used for monitoring to determine compliance with the standards are those taps that are normally used for drinking, cooking, food preparation or other domestic purposes. In a domestic property, this tap is the kitchen cold water tap that is used for drinking and food preparation purposes.

Disinfection of the cold water tap is recommended prior to sampling for bacteriological parameters and should follow the guidance given in the Microbiology of Drinking Water Supplies 2002.

Regulation 4(4) - Sampling on Transfer from a Water Treatment Works

Water Treatment Works

- 3.5 Regulation 4(4) defines the criteria for wholesomeness on transfer from a water treatment works. Regulation 13(1) requires Water Service to ensure that samples for *E. coli*, coliform bacteria, colony counts, residual disinfectant, turbidity and nitrite are taken at the required frequency from the point at which water leaves each treatment works. Sampling for the other parameters within Table 3 of Schedule 3 to the Regulations may be sampled at the treatment works or other authorised supply point.
- 3.6 The sampling point should be located so as to provide a representative sample of the water flowing into distribution. The sample point must be downstream of all treatment processes, including blending, and any storage in final water storage reservoirs at the treatment works.
- 3.7 Where the treatment stream within a works divides in such a way that a single final water compliance point will not be 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 will be required. Where there is a possibility of differences in water quality within different outlet mains leaving the treatment works, then separate sampling points are required for each different final water. Although on the same site, each treatment train is regarded as a separate water treatment works for the purposes of the Regulations.
- 3.8 All treatment works' outlets should be fitted with metal sampling taps of a hygienic design which do not have attachments or inserts and which are made from materials complying with BS6920. Water should be supplied to the sampling tap through a sample line of a suitable material, which if plastic, complies with BS6920. Sample lines should be kept as short as possible.

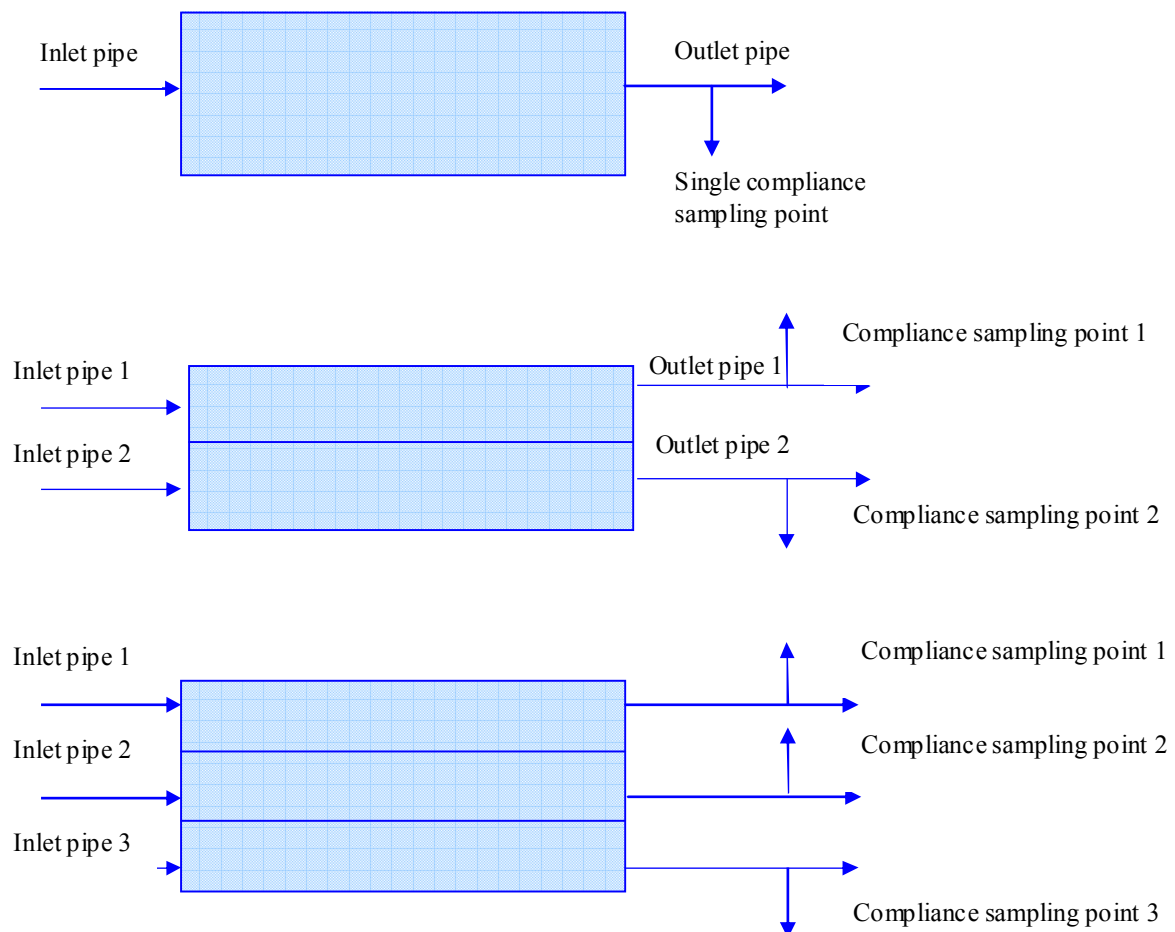
Regulation 4(5) - Sampling on Transfer from a Service Reservoir

Service Reservoir

- 3.9 Regulation 4(5) defines the criteria for wholesomeness on transfer from a service reservoir. Regulation 14 requires Water Service to ensure that a sample is taken for bacteriological analysis and determination of residual disinfectant, in each week the reservoir is in use. Water Service should be confident that samples taken are representative of the water that leaves each service reservoir.
- 3.10. The Regulations define a service reservoir as any structure in which a reserve of treated water is contained and stored for the purposes of meeting a variable demand for the supply of water. The definition specifically excludes any structure at a water treatment works such as final water storage reservoirs. Sampling points at water treatment works should be located so as to provide a representative sample of the water flowing into distribution and this should be downstream of any final water storage reservoirs at the treatment works.

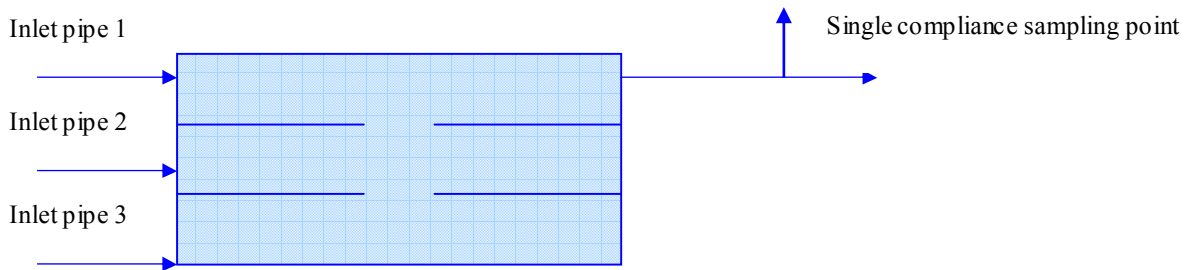
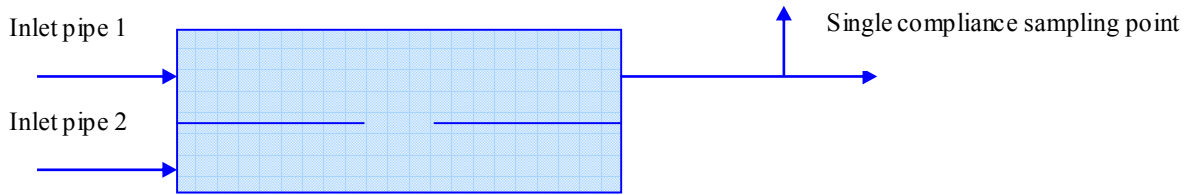
- 3.11 Break pressure tanks should not be designated as service reservoirs unless they are designed to provide strategic water storage. Water Service may have water retaining structures which are solely connected to further service reservoirs and do not supply consumers directly via distribution mains. If such water retaining structures contain strategic reserves of water, they should be classified as service reservoirs and sampled within the compliance sampling programme.
- 3.12. 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 should be regarded as a single service reservoir. Sampling is required at the outlet main of each compartment unless the individual outlets subsequently combine into a single common outlet main. This is illustrated in the following schematic:

Service Reservoirs- Schematic Plans



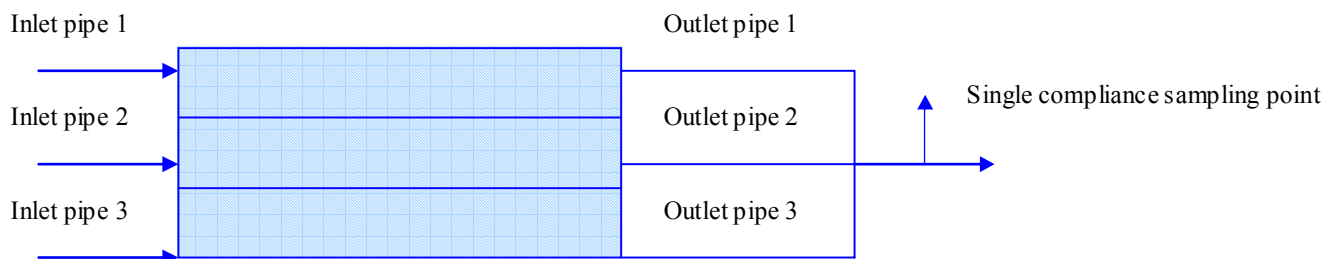
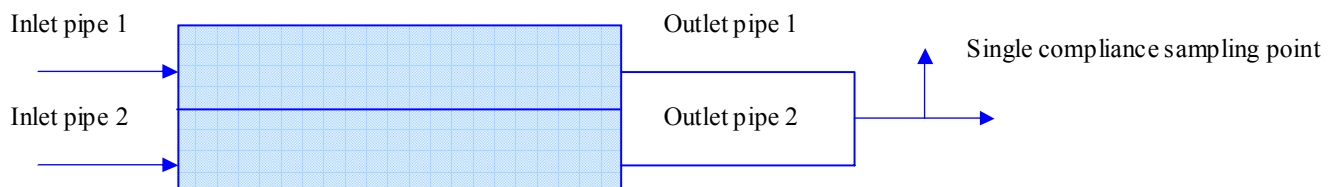
- 3.13 Where a service reservoir has more than one compartment but the compartments are hydraulically connected, then the connected compartments may collectively be regarded as a single service reservoir and be sampled accordingly. This is illustrated in the following schematic:

Service Reservoirs – Schematic Plans



3.14 Where a service reservoir has a single common inlet and outlet main, Water Service must have arrangements to ensure that samples are only taken 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. This is illustrated in the schematic below. Where this is not practicable, alternative representative sampling arrangements can be made.

Service Reservoirs – Schematic Plans



3.15 All service reservoir outlets should be fitted with metal sampling taps of a hygienic design which do not have attachments or inserts and which are made from materials complying with BS6920. Water should be supplied to the

sampling tap through a sample line of a suitable material, which, if plastic, complies with BS6920. Sample lines should be kept as short as possible.

Other Sampling Arrangements at Water Treatment Works and Service Reservoirs

- 3.16 It is not possible for this Guidance to describe all the possible arrangements for the siting of regulatory sampling points at water treatment works and service reservoirs. Where Water Service is unsure about the number or siting of regulatory sampling points, it should submit details of its proposals to DWI for approval.

PART IV

MONITORING OF WATER SUPPLIES

Regulation 6(1) – Monitoring: Number of Samples

Monitoring: Number of Samples

- 4.1 Regulation 6(1) states that Water Service shall take and analyse not less than the number of samples specified within the provisions of Part IV. Water Service may programme and report more than the minimum number specified for any parameter to ensure that the minimum sampling and analysis requirement is met.
- 4.2 It is recognized that Water Service may wish to carry out some additional sampling to provide additional information on the quality of water supplies. Water Service may prefer to manage such monitoring within a separate non-compliance sampling programme, with individual samples identified by a separate sample reason code.
- 4.3 Water Service may carry out sampling for both compliance and non-compliance 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).
- 4.4 If Water Service wishes to carry out additional sampling within the regulatory monitoring programme, it should not programme significantly above the numbers specified for selected parameters in order to influence compliance statistics.

Regulation 6(2) - Monitoring: General Provisions

Monitoring for Pesticides – Monitoring Strategy

- 4.5 It is not practical or necessary to monitor for every pesticide that is used within the catchment of a water source. The Drinking Water Directive recognizes this by noting that only those pesticides which are likely to be present in a given supply need to be monitored.
- 4.6 To effectively implement the requirements of the Drinking Water Directive, Water Service is required to develop a monitoring strategy for pesticides at each treatment works based on the likely risk of particular pesticides being present in the water source or sources from which water is abstracted for treatment at that treatment works. In developing a monitoring strategy, Water Service is expected to:
 - (i) assess, as far as is practicable, which pesticides are used in significant amounts within the catchment area of each water source;
 - (ii) assess, as far as is practicable on the basis of the properties and method of use of these pesticides, and local catchment knowledge, whether any

of these pesticides are likely to reach each water source in the catchment area;

- (iii) take into account the results of any monitoring for pesticides in water sources within the catchment area carried out by Environment and Heritage Service;
 - (iv) take into account the results of any operational monitoring of water sources or water supplies for pesticides carried out previously by Water Service; and
 - (v) take into account the results of the compliance monitoring of water supplies for pesticides carried out under the provisions of The Water Quality Regulations (Northern Ireland) 1994 (1994 Regulations).
- 4.7 On the basis of the strategy, the water leaving each treatment works (or supply point) should be monitored at the frequency specified in Table 3 of Schedule 3 to the Regulations, for each of the pesticides identified as likely to reach a water source from which water is abstracted to that treatment works. Where a treatment works has a treatment process installed to remove pesticides or reduce the concentration of pesticides, Water Service must include in its monitoring strategy for that treatment works those pesticides for which the treatment process has been installed.
- 4.8 Aldrin, dieldrin, heptachlor and heptachlor epoxide must be included in the monitoring strategy for each treatment works unless Water Service has convincing evidence that these pesticides are not detected in the water supplied from the treatment works. DWI recognizes that these pesticides have not had approved use for many years and that a monitoring programme for these pesticides may not be necessary. However, they can be persistent in the environment, and occasional detections in drinking water have occurred. If Water Service is of the opinion that there is no need to monitor for these pesticides, it should submit to DWI a reasoned case, backed up with whatever data are available. Normally, this should include a minimum of three years' data from the most recent period when monitoring was conducted. The data must have a limit of detection well below the new standard. The frequency of monitoring should be at least that specified in the Regulations. Where appropriate, regulatory data can be supplemented by relevant operational data, or data from other organizations such as Environment and Heritage Service (Water Management Unit).
- 4.9 If, at any time, Water Service has any reasonable grounds for believing that a pesticide not included in its monitoring strategy for a particular works could be present at a concentration in excess of the standard, it must include that pesticide in its monitoring strategy for that works. It may also be appropriate and advisable for Water Service to carry out operational monitoring for that pesticide in the water source or sources from which water is abstracted to the treatment works, in order to provide additional information about the behaviour of the pesticide.

- 4.10 Towards the end of each calendar year, Water Service should review its monitoring strategy for each treatment works, using the guidance in paragraph 4.6 above. A particular pesticide may be omitted from the monitoring strategy if it has not been detected at significant concentrations in the water supplied from the works in the previous three calendar years compliance monitoring under the 1994 Regulations or the new Regulations. A pesticide for which a treatment process has been installed, can only be omitted from the monitoring strategy for that treatment works if Water Service can show, from at least three years' operational monitoring of the water source or sources from which the water is abstracted, that the pesticide is no longer detected at significant concentrations in the water source or sources.
- 4.11 It is recognized that particular analytical methods for pesticides enable a suite of pesticides of similar chemical structure or properties to be determined. Water Service may continue to monitor all the pesticides in the suite even if a particular pesticide could be omitted because it had not been detected in the previous three years.
- 4.12 The standards for pesticides apply at consumers' taps. However, regulation 8(1) allows Water Service to monitor compliance with those standards by taking samples for pesticides from supply points because the results of the analysis of such samples are unlikely to differ in any material respect from the results of the analysis of samples taken from consumers' taps.

Regulation 6(3) - Monitoring: Sampling - Tankers

Monitoring: Sampling – Tankers

- 4.13 Regulation 4(3) defines the point of compliance as the consumer's tap, or, in the case of water supplied by tanker, the point at which the water emerges from the tanker. Regulation 6(3) requires Water Service to take samples from water tankers in specified circumstances. Within Northern Ireland, water is not normally distributed by tanker except on occasion for short term supplies associated with operational work or emergency provisions. Regulation 6(3) does not apply to the use of tankers to fill service reservoirs.
- 4.14 For the purposes of these Regulations, water tankers are considered as any mobile water tank used to provide water supplies to consumers on a temporary basis, and include water bowsers. Water tankers should only be filled with wholesome water from a known source.
- 4.15 The Regulations require monitoring for *E. coli*, hydrogen ion and conductivity from each tanker that has been providing water for longer than 48 hours. Any tanker that has been providing water continuously for more than 96 hours must be sampled and analysed for full microbiological and chemical analysis. Further samples for full microbiological and chemical analysis must be taken every additional 48 hours that the tanker is in use. Provided tankers are collected or

emptied before a 48 hour period has elapsed, there is no monitoring requirement. A tanker should only be filled and refilled with wholesome water.

Regulation 6(6) - Monitoring: Copper, Lead and Nickel

- 4.16 The Regulations require sampling of water supplies at the consumer's tap for copper, lead and nickel at the audit frequency specified in Table 2 of Schedule 3. Samples for these parameters must always be taken at consumers' taps. The sampling point should be selected from the random sampling programme and the sample should be the first one litre of water drawn from the tap without flushing.

Regulation 6(7) – Monitoring: Radioactivity

- 4.17 The Regulations require sampling of water supplies for the determination of radioactivity. Sampling is to be undertaken at the audit frequency specified in Table 2 or Table 3 of Schedule 3. Analysis is required for tritium as an individual radionuclide which is effectively a screening parameter for the presence of contamination by artificial radionuclides. Monitoring for Total Indicative Dose (TID) is routinely achieved by analysis for gross alpha and gross beta activities, although it is calculated from the activities of individual radionuclides using the summation formula in the EC Guidance Document (see 4.25). Calculation of TID is only required if any of the screening values for gross alpha (0.1Bq/l), gross beta (1.0 Bq/l) or tritium are exceeded.
- 4.18 Monitoring of drinking water for Total Indicative Dose (TID) shall be necessary where a source of artificial or enhanced natural radioactivity is present within the catchment and it cannot be shown on the basis of other surveillance programmes or investigations that the level of TID is well below its parametric indicator value of 0.1mSv/year. Where monitoring for artificial radionuclide levels is required, it shall be carried out at the audit frequency.
- 4.19 Where monitoring for natural radionuclide levels is required, DWI will define an appropriate frequency considering all relevant available information provided by Water Service on temporal variations of natural radionuclide levels in different types of waters. Depending on the expected variations, monitoring frequency may vary from a single check-up measurement up to the frequency of audit monitoring. Where only a single check-up for natural radioactivity is required, a recheck shall be required at least where any change occurs in relation to the supply likely to influence the concentrations of radionuclides in the drinking water.
- 4.20 Where methods for removing radionuclides from drinking water have been introduced to ensure that a parametric indicator value is not exceeded, monitoring shall be carried out at the audit frequency.
- 4.21 Water Service should use screening methods for gross alpha activity and gross beta activity to monitor for the parametric value for TID. If the gross alpha and the gross beta are less than 0.1Bq/l **and** 1.0Bq/l respectively, Water Service may assume that the TID is less than the parametric indicator value of 0.1mSv/year and

no further radiological investigation is needed. If the gross alpha activity exceeds 0.1Bq/l or the gross beta activity exceeds 1.0Bq/l, analysis for specific radionuclides shall be required. The radionuclides to be measured shall be defined by taking into account all relevant information about likely sources of radioactivity. Where necessary, tritium, gross alpha activity and gross beta activity should be measured in the same sample.

4.22 Appendix 7 contains a flow chart which gives guidance on two key issues:

- (i) the need for statutory monitoring for Total Indicative Dose; and
- (ii) how to respond to results for gross alpha and beta activity.

The flow chart attempts to deal with a variety of circumstances but does not attempt to specify the form of any more detailed analysis. This must be judged on a case by case basis. The flow chart does not apply to monitoring for tritium.

4.23 Instead of the gross alpha and gross beta activity screening discussed above, Water Service may use screening methods for specific radionuclides to indicate reliably the presence of radioactivity in drinking water. If one of the activity concentrations exceeds 20% of its reference concentration (see Table 1 below) or the tritium concentration exceeds its parametric value of 100Bq/l, analysis of additional radionuclides shall be required. The radionuclides to be measured shall take into account all relevant information about likely sources of radioactivity.

4.24 Regulation 6(7) permits DWI to notify Water Service that monitoring for radiological parameters is not required where it is satisfied that the water supply is well below the specification for the relevant parameters. DWI will inform Water Service by **Notice** where it has been satisfied that there is sufficient information to establish that water supplies meet these criteria and there is no need for audit monitoring.

Calculation of the Total Indicative Dose (TID)

4.25 The TID is the committed effective dose for one year of intake resulting from all the radionuclides whose presence in a water supply has been detected, both of natural and artificial origin, but excluding tritium, potassium-40, radon and radon decay products. The TID is calculated from the radionuclide concentrations and the dose coefficients for adults laid down in Annex III, Table A of the European Directive, 96/29/Euratom (laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation).

Where the following formula is satisfied, Water Service may assume that the TID is less than the parametric indicator value of 0.1mSv/year and no further investigation is required:

$$\sum_{i=1}^n \frac{C_i (obs)}{C_i (ref)} \leq 1$$

where

- $C_i (obs)$ = observed concentration of radionuclide i
 $C_i (ref)$ = reference activity concentration of radionuclide i (Table 1)
 n = number of radionuclides detected.

4.26 Where the formula is not satisfied, the parametric indicator value will only be exceeded if the radionuclides are persistently present at similar activity concentrations for a full year. DWI will define the degree of resampling necessary to ensure that the measured values are representative for an average activity concentration for a full year. Where representative sampling shows that the parametric indicator value is exceeded, DWI will advise what action is necessary to achieve compliance.

TABLE 1: REFERENCE CONCENTRATIONS FOR RADIOACTIVITY IN DRINKING WATER ¹

Origin	Nuclide	Reference Concentration
Natural	U-238 ²	3.0Bq/l
	U-234 ²	2.8Bq/l
	Ra-226	0.5Bq/l
	Ra-228	0.2Bq/l
Artificial	C-14	240Bq/l
	Sr-90	4.9Bq/l
	Pu-239/Pu-240	0.6Bq/l
	Am-241	0.7Bq/l
	Co-60	40Bq/l
	Cs-134	7.2Bq/l
	Cs-137	11Bq/l
	I-131	6.2Bq/l

¹ This table includes the most common natural and artificial radionuclides. Reference concentrations for other radionuclides can be calculated using the dose coefficients for adults laid down in Annex III, Table A of Directive 96/29/Euratom, or more recent information recognized by the competent authorities in the Member State, and by assuming an intake of 730 litres per year.

² One milligram (mg) of natural uranium contains 12.3Bq of U-238 and 1 Bq of U-234. Table 1 allows only for the radiological properties of uranium, not for its chemical toxicity.

Monitoring for Tritium

4.27 Monitoring of drinking water for tritium shall be necessary where a source of tritium is present within the catchment and it cannot be shown on the basis of other surveillance programmes or investigations that the level of tritium is well

below its parametric indicator value of 100Bq/l. Where monitoring for tritium is required, it must be carried out at the audit frequency.

- 4.28 Tritium was included in the Drinking Water Directive on the basis that it provides an indication of other, potentially more harmful, artificial radionuclides discharged into the environment. In the UK, such discharges are subject to stringent controls and even where authorised discharges of artificial alpha and beta emitters occur within the water catchment, the concentrations of tritium are low and routinely below 10Bq/l.
- 4.29 In these circumstances, monitoring of tritium in drinking water would be a check on ongoing discharges of radioactivity to the environment. Environmental sampling programmes already exist, tailored to sample close to the source of discharges. Elevated concentrations of tritium have been associated with landfill leachates where the tritium probably derives from the disposal of gaseous tritium lighting devices and is not an indicator of other artificial radionuclides. In these cases, elevated gross beta activity has also been detected in the water, probably due to the presence of particulates and natural potassium-40. The relationship between tritium and landfill sites is best investigated by research projects rather than routine monitoring.
- 4.30 It is not considered necessary for Water Service to carry out routine monitoring for tritium in drinking water sources unless there is evidence of elevated beta activity or Water Service has reason to believe it may be significantly present.

Regulation 7 - Sampling Points: Random Selection

Random Selection of Sampling Points

- 4.31 Regulation 7 requires all sampling points to be selected at random, except in relation to those parameters where monitoring from supply points has been authorised. Water Service is expected to use a sampling programme that selects sample points at random from a comprehensive list of its consumers.
- 4.32 Water Service's methods should ensure random selection from a consumer list to produce an individual target address or a sampling location such as a designated street or a designated postcode. If a sample cannot be obtained from the target sample address, a neighbouring property should be chosen and appropriate records amended accordingly. A check should always be made to ensure that any alternative address is within the target water supply zone, especially when properties are close to the water supply zone boundaries.
- 4.33 DWI expects Water Service to be able to obtain samples from randomly selected sample points in most circumstances. In exceptional circumstances, Water Service may apply to DWI to use an alternative method of selection for sample points.
- 4.34 DWI is aware that Water Service may have concerns regarding the security of samplers in some specific locations. Where Water Service considers that these

concerns prevent the implementation of sampling by random selection of sample points, it should provide DWI with information on its alternative method. DWI will indicate whether the alternative method is acceptable.

Regulation 8(1) - Authorisation of Supply Points

- 4.35 Regulation 8(1) authorises the use of supply points for monitoring specified parameters. Supply points may be:
- treatment works
 - service reservoirs
 - blending points
- 4.36 In addition to these designated supply points, under regulation 8(2) subject to paragraph (3), Water Service may apply to use fixed sample taps fitted directly to principal distribution mains for parameters not specified by regulation 8(1). Water Service should ensure that sample points are fitted with metal sampling taps of a hygienic design which do not have attachments or inserts and which are made from materials complying with BS6920. They should be fitted in such a way as to ensure that the sample is representative of the water in the main.
- 4.37 A blending point means a point at which treated waters, originating from two or more sources, are combined under controlled conditions. In practice, blending is normally accomplished by the controlled mixing of treated waters in service reservoirs and specific sections of trunk main.
- 4.38 The position of any authorised supply point at a blending point should be carefully selected to ensure that adequate mixing has taken place prior to the sample point. There should be no subsequent significant change in the value or concentration of the authorised parameters between the supply point and consumers' taps.

Regulation 8(2) - Authorisation of Parameters for Supply Point Monitoring

- 4.39 The Drinking Water Directive permits the use of monitoring at supply points provided that for any particular parameter it can be demonstrated that there would be no adverse change to the measured value. Regulation 8(3) allows DWI to authorise sampling from either a supply point as specified in regulation 8(1) or another supply point instead of sampling points (consumers' taps), for parameters other than those specified in regulation 8(1), when DWI is satisfied that the results of the analysis of samples taken from the supply point are 'unlikely to differ in any material respect' for a particular parameter from the results that would be produced from the analysis of samples taken from sampling points. Where DWI authorises particular parameters to be monitored at supply points, the sampling frequency should be that applying to audit monitoring in Table 3 of Schedule 3.

4.40 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':

- ***E. coli*, coliform bacteria and colony counts** as these are likely to change in concentration through the distribution system;
- **lead, copper, nickel and chromium** because these metals can be present from contact of the water supplied with plumbing materials;
- **iron, manganese and aluminium** because these metals can be present in water leaving treatment works and picked up from deposits in the distribution system;
- **polycyclic aromatic hydrocarbons and benzo (a) pyrene** because these substances can be present from contact of the water supplied with coal tar pitch linings within the distribution system;
- **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;
- **hydrogen ion** because this can change as the water passes through the distribution system, and by treatment equipment within consumers' premises;
- **sodium** because this can increase when sodium hypochlorite is added during distribution and when treatment equipment is used within consumers' premises;
- **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;
- **nitrate** because of the need to calculate the nitrate/nitrite formula; and
- **trihalomethanes** when the water supply originates from, or is influenced by surface water as the concentrations leaving the treatment works are likely to vary significantly as the water passes through the distribution system. Groundwaters are influenced by surface waters when water quality changes occur as a result of rainfall or changes in river flows.

4.41 Authorisation to sample from supply points could be considered in the following circumstances because the results are unlikely to 'differ in any material respect':

- **antimony, arsenic, cadmium, chromium and selenium** when Water Service can demonstrate for a particular supply or supplies that these metals have not been detected at significant concentrations (significant would be >10% of PCV, e.g. for antimony with a PCV of 50µg/l, this would be values >0.5µg/l) in samples taken from consumers' taps for at least two years.

• **trihalomethanes** when the water supply zones are supplied with water that originates solely from groundwater and Water Service can demonstrate that the concentrations at consumers' taps have been an average of 30µg/l or less for at least two years and not exceeded 50µg/l in that time.

Regulation 9(1) - Monitoring: Numbers of Samples

4.42 The majority of parameters require monitoring at either a check monitoring (high) or audit monitoring (lower) frequency exclusively. There is also a range of monitoring at intermediate frequencies for the six parameters to be monitored at the water treatment works. There are six parameters which can **either** be monitored at check monitoring frequency, or at audit monitoring frequency, depending on the following circumstances:

- (i) **aluminium and iron** are to be monitored at the lower audit monitoring frequency unless they are used as a flocculant or the water originates from, or is influenced by surface waters, in which case the higher check monitoring frequency applies;
- (ii) **manganese** is to be monitored at the lower audit monitoring frequency in Schedule 3, Table 2 unless the water originates from, or is influenced by surface waters, in which case the higher check monitoring frequency applies;
- (iii) ***Clostridium perfringens*** is to be monitored at the audit monitoring frequency in Schedule 3, Table 2 or Table 3 unless the water originates from, or is influenced by surface waters, in which case the higher check monitoring frequency applies;
- (iv) **nitrite and nitrate** are also to be monitored at the lower audit monitoring frequency in water supply zones unless chloramination is practised at the water treatment works, in which case the higher check monitoring frequency applies in the water supply zones. **In addition**, there is a requirement to monitor for nitrite at the water treatment works, against the 0.1mg/l standard. Nitrite is to be monitored at the water treatment works at the lower audit monitoring frequency in water supply zones unless chloramination is practised, in which case the higher monitoring frequency specified in Table 3 of Schedule 3 applies; and also
- (v) Water Service should consider undertaking additional operational monitoring at groundwater sources which have significant natural concentrations of iron and/or manganese.

- 4.43 The requirements for nitrate and nitrite monitoring are illustrated in the following examples:

Example A

A water treatment works, which practises chloramination, has an annual average output of 25,000m³/d and supplies three water supply zones with populations of:
WSZ1 25,000 WSZ2 35,000 WSZ3 65,000

Monitoring required at WTWs

Nitrite (against standard of 0.1mg/l) – 365 samples per annum (standard frequency)

Check monitoring required in water supply zones

Nitrite (against standard of 0.5mg/l) and nitrate (against standard of 50mg/l)

WSZ1 – 24 samples per annum (at standard frequency)

WSZ2 – 36 samples per annum (at standard frequency)

WSZ3 – 52 samples per annum (at standard frequency)

Example B

A water treatment works, which does not practise chloramination, has an annual average output of 10,000m³/d and supplies two water supply zones with populations:

WSZ1 4,000

WSZ2 56,000

Audit monitoring required at WTWs

Nitrite (against standard of 0.1mg/l) – 8 samples per annum

Audit monitoring required in water supply zones

Nitrite (against standard of 0.5mg/l) and nitrate (against standard of 50 mg/l)

WSZ1 – 4 samples per annum

WSZ2 – 8 samples per annum

Regulation 9(1) - Monitoring: Analysis Using Monitors

- 4.44 Regulation 16(3) extends the scope of the term “laboratory” to a person who may undertake analysis at the time and place at which the samples are taken. This allows the potential use of results from continuous water quality monitors for certain parameters, e.g. turbidity and conductivity.
- 4.45 The results from continuous water quality monitors could only be used if the following criteria are met:
- (i) the monitor must be capable of satisfying the prescribed performance characteristics for analysis of that parameter as specified in regulation 16(5);

- (ii) there must be a mechanism to predetermine the times and dates at which results are to be determined. Predetermination does not necessarily require a fixed time and day to be specified. A system to randomly pre-select the time and day of the statutory result would be acceptable; and
- (iii) Water Service must maintain records to establish that the appropriate requirements of regulation 16(2) are met.

Regulation 9(2) - Numbers of Samples: Reduced Frequency

Reduced Frequency

- 4.46 Regulation 9(2) allows Water Service to take a reduced number of samples for those parameters that are subject to check monitoring, provided specified conditions are met.
- 4.47 One of the conditions is that Water Service is of the opinion that the quality of water supplied by it to a water supply zone is unlikely to deteriorate. Water Service would be expected to take into account when reaching its opinion the following factors. Whether there:
- (i) has been any change in the activities within the catchment or the condition of the catchment which is likely to have an adverse effect on the quality of the raw water;
 - (ii) is any evidence of a general deterioration in the quality of the raw water, or the water supplied from the treatment works; and
 - (iii) is any evidence of a general deterioration in the quality of water as it passed through the distribution system to consumers' properties.
- 4.48 Another of the conditions is that the results of the analysis of samples in each of two successive years (or the results of the last 12 samples where less than this number has been taken in two years) show no significant variation and, except for colony counts and pH value, the concentration or value is significantly lower than the prescribed concentration or value. The following paragraphs give guidance on specific parameters.
- (i) **aluminium, ammonium, colour, conductivity, iron, manganese, nitrate, nitrite and turbidity** - a significant variation is when any result deviates from the arithmetic mean concentration or value, in either of the two years, (or in the results of the last 12 samples where less than this number has been taken in two years) by more than 20% of the prescribed concentration or value. For these parameters significantly lower is when all the values in each year (or in the results of the last 12 samples where less than this number has been taken in two years) are below 50% of the prescribed concentration or value.

- (ii) **taste and odour** - a reduced frequency can only be applied when all the results in the previous two years (or in the results of the last 12 samples where less than this number has been taken in two years) have been 1 dilution number.
- (iii) ***Clostridium perfringens* (including spores)** - a reduced frequency can only be applied when the organism has not been detected in any of the samples taken in the two years (or in the results of the last 12 samples where less than this number has been taken in two years).
- (iv) **colony counts** - no significant variation and no abnormal change is when all the results obtained in the two years (or in the results of the last 12 samples where less than this number has been taken in two years) are within plus or minus one order of magnitude of the mean.
- (v) **hydrogen ion** - no significant variation is when all the results for the pH value in the two years (or in the results of the last 12 samples where less than this number has been taken in two years) are within a spread of 1 pH unit. A reduced frequency cannot be applied when **any** result is below a pH value of 6.5 or above a pH value of 10.0.

Regulation 9(4) - Numbers of Samples: Regular Intervals

Regular Intervals

4.49 Regulation 9(4) requires samples to be taken at regular intervals. Regular sampling means having a suitable spread of samples to detect possible variation in water quality. Variation could occur on long-term (seasonal) or more short-term (within a week or day due to operational changes) basis. The requirement for regular sampling does not mean that the sampling occasions have to be spread at exactly equal intervals. For water supply zones, the most common sample frequencies are 12, 24 and 36 per annum. Samples should generally be taken at one, two or three times per month. It is important that there is a good spread between the sampling events. For sampling frequencies of 52 and 76 per annum, samples should be taken once and sometimes twice a week to meet the targets. Ideally, the day within each week that the sample is taken should be randomized. However, it is recognized that it may not be practicable to fully randomize the day of sampling. Where the sources of supply or operation of a works, service reservoir or zone are known to vary significantly over the period of a week, the sampling programme should be managed to ensure some variation in the day of the week in which the sample is taken.

4.50 For service reservoirs, samples should be taken in each week that the service reservoir is in operation. Ideally, the day within each week that the sample is taken should be randomized. However, it is recognized that it may not be practicable to fully randomize the day of sampling and, in such cases, the sampling programme should be managed to ensure some variation in the day of the week in which the sample is taken.

Summary

4.51 A summary of the sampling requirements for each parameter is given in the table in Appendix 11.

PART V

MONITORING - ADDITIONAL PROVISIONS

Regulation 13 - Sampling at Water Treatment Works

- 5.1 Regulation 13(2) provides for a reduced frequency of sampling for the colony counts parameter 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.
- 5.2 Regulation 13(4) provides for a reduced number of samples for the coliform bacteria parameter and the *E. coli* parameter only when Water Service is of the opinion:
- (a) that there is no foreseeable risk that the supply will exceed the maximum concentration for the parameter; or
 - (b) that the treatment works is designed to secure that, in the event of a failure of the disinfection process, water that has not been disinfected cannot enter the supply.
- 5.3 In respect of (a), Water Service would be expected to take into account when reaching its opinion the following factors:
- (i) risk factors and activities in the catchment from which the water source is drawn;
 - (ii) the concentrations of the parameter in the raw water;
 - (iii) the nature and capability of the treatment processes at the works; and
 - (iv) the concentration of the parameter in the water leaving the treatment works over the previous two years.
- 5.4 In respect of (b), this requirement would be met when:
- (i) a treatment works automatically shuts down almost immediately after a disinfection failure is detected; or
 - (ii) procedures are in place for a treatment works to be manually shut down almost immediately after an alarm is received warning of a disinfection failure.
- 5.5 It is unlikely that a reduced frequency could be applied to only one of the coliform bacteria or *E. coli* parameters.

- 5.6 Regulations 13(2) and 13(4) deal with the adoption of reduced frequency monitoring. Where there is a failure to meet the PCV or an exceedence of an indicator parameter value occurs at a treatment works where reduced frequency monitoring has been adopted, sampling should be increased to the standard frequency on a pro rata basis for the remainder of that year and the following two calendar years.
- 5.7 Sampling frequencies are normally based on the volume of water supplied in m³/day. Sampling frequencies should be based on the average daily output from the works during the previous calendar year, except where it is known that the current year's average daily output will be significantly different from the previous average daily year's output. Where there is more than one outlet at a works requiring separate sampling points (as explained in paragraph 3.7), the sampling frequency should be determined separately for each sampling point based on the average daily output at each point.
- 5.8 Normally, Water Service would be expected to establish, prior to the start of the calendar year, its annual sampling frequency for each works based on the previous year's average daily output from the works, or the anticipated average daily output for the current year. Where a treatment works, whose output may vary considerably at different times of the year for extended periods, Water Service should consider adjusting the frequencies in accordance with the average daily output for those periods.
- 5.9 Regulation 13(5) requires samples to be taken at regular intervals. For water treatment works, sampling frequencies may range from 2 to 2,190 per annum. A sample frequency of 365 per annum requires a sample to be taken on each calendar day of the year (and should include February 29 in each leap year). For sample frequencies in excess of 365 per annum, samples should be taken over as large a daily span as is possible. They do not have to be spread at exactly equal intervals but should be broadly spread to be representative of any potential changes in water quality during the day. There must be a mechanism to pre-determine the time of sampling.
- 5.10 For sampling purposes, a treatment works is considered to be in service on every day (midnight to midnight) that any treated water is supplied from the works.

Regulation 16 - Collection of Samples

- 5.11 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 complies with the requirements. Other paragraphs cover definitions and the procedure for authorising the use of alternative methods for microbiological analysis.

- 5.12 This regulation does not apply to *Cryptosporidium* analysis for the purposes of Part VII of the Regulations. For the collection of *Cryptosporidium* samples, refer to paragraph 7.3

Regulation 16(2) – Collection and Analysis

- 5.13 Subparagraphs (a) and (b) require that the sample is representative of the quality of the water being sampled at the time of sampling and that the sample is not contaminated when being taken. Subparagraph (c) specifies that samples must be kept in conditions that will ensure that the sample does not deteriorate in any significant way between sampling and the commencement of analysis.
- 5.14 Water Service, or its sampling contractor, should produce a comprehensive sampling manual setting out the procedures and precautions to be adopted for each parameter or group of parameters.

Sampling Manual for Microbiological Parameters

- 5.15 As a minimum requirement, the sampling manual should include relevant information on the types of sample bottle, the preparation of sample bottles, the sampling procedures and the transportation of samples. Details of recommended sampling procedures are given in ‘The Microbiology of Drinking Water 2002, Part 2.’

Sampling Manual for all Other Parameters

- 5.16 The nature of parameters varies widely, and a range of sample containers, cleaning regimes, and methods of sample preservation and storage will be required. For example, mercury is highly volatile even at low temperatures, and requires the addition of preservative at the time of sampling. Polycyclic aromatic hydrocarbons react with chlorine and are light-sensitive and therefore require the immediate destruction of chlorine and storage in the dark. Other parameters are volatile or subject to biological degradation and require immediate refrigeration.
- 5.17 As a minimum requirement, the sampling manual should specify:
- (i) the types of bottles or containers, their closures and the purposes for which they are to be used;
 - (ii) where relevant, the cleaning procedure and shelf life for bottles, containers and closures used for each parameter, including the amount and type of preservative to be added;
 - (iii) the sampling procedure for each parameter, including the type of sample to be collected (e.g. first draw, flushed, stagnation) and the procedure for collecting samples for different parameters;
 - (iv) the order of sampling; and

- (v) the conditions of storage and transport of samples and the maximum time that can elapse before analysis should commence for each parameter.
- 5.18 Further general information on sampling procedures is given in ‘General Principles of Sampling and Accuracy of Analytical Results’ in the series ‘Methods for the Examination of Water and Associated Materials’ published by the Standing Committee of Analysts. Detailed information for individual parameters or groups of parameters is given in the individual booklets in the same series.

Training of Samplers

- 5.19 In order to carry out sampling correctly, it is essential that all samplers are fully trained and competent before they are allowed to work unsupervised. Water Service or its sampling contractor should produce a comprehensive sampler training programme to cover all aspects of sampling.
- 5.20 Once trained, all samplers’ performance should be monitored and subject to regular audit. Monitoring and audit procedures, and criteria for satisfactory performance and policy on retraining should be documented.
- 5.21 A training record should be produced for each sampler, detailing the training given, with dates and assessment of competence, results of any audits, any retraining or further training given and any reassessment of competence.
- 5.22 Subparagraph (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.

Regulation 16 – Analysis of Samples

- 5.23 Detailed advice on this part of the Regulations is given in Appendix 1.

PART VI

INVESTIGATIONS, AUTHORISATIONS OF DEPARTURES AND REMEDIAL ACTION

Regulation 17(1) – Investigations

Schedule 1 Parameters

- 6.1 A summary of the investigations for Schedule 1 parameters is given in Appendix 5. Note that where the Inspectorate agrees the exceedence is trivial and unlikely to recur, then no further action is necessary.
- 6.2 DWI will be notified electronically by Water Service (Standards and Regulations Directorate) of all contraventions of the standards for compliance monitoring. This initial notification will be followed up with an investigation report that presents the cause and extent of the failure; whether there is confirmation that any remedial action identified has been satisfactorily completed, or that a date for completion of remedial action has been identified. The information reporting requirements are contained within Appendix 2.
- 6.3 In addition, regulation 34 (8 and 9) requires Water Service to notify DWI regarding the occurrence of any event which gives rise, or is likely to give rise to a significant risk to health. Events and incident reporting procedures are contained within Appendix 4.
- 6.4 Regulation 17(1) requires that when Water Service 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, that it shall investigate the cause of that failure or likely failure. Similarly, regulation 17(3) requires Water Service to investigate the cause of any failure or likely failure to meet the concentration or value specified in an authorisation.
- 6.5 The definition of a failure is clear. It is when the analysis of a sample taken as required by the Regulations exceeds a concentration or value specified for the parameters in Schedule 1 of the Regulations. However, the terms of “likely to fail” or “likely failure” are not defined in the Regulations.
- 6.6 Water Service may have reason to believe that the water supplied is **likely to fail** in the following circumstances:
- (i) there is evidence from the analysis of samples taken as required by the Regulations that the trend in the concentration or value of a particular parameter is generally and steadily increasing (or decreasing) towards the prescribed concentration or value, and if that trend continues, the water will fail to meet the prescribed concentration or value in the future, say within five years. Such evidence may be available for the nitrate parameter, for example;

- (ii) where no regulatory samples have exceeded the prescribed concentration or value for a particular parameter, but, there is evidence from the analysis of non-regulatory samples such as for operational control purposes* or samples taken in response to consumer complaints or consumer requests, that the prescribed concentration or value has been breached; and
- (iii) where no regulatory samples have exceeded the prescribed concentration or value for a particular parameter, but, there is evidence from the analysis of non-regulatory samples such as operational control purposes* or samples taken in response to consumer complaints or consumer requests, that the concentration or value is generally and steadily increasing (or decreasing) towards the prescribed concentration or value, and if that trend continues, the water will fail to meet the prescribed concentration or value in the future, say within five years.

** Operational control samples means all samples collected and brought into the laboratory for analyses, for the purposes of operational control.*

Regulation 17(2) - Failures Attributable to the Domestic Distribution System

- 6.7 Regulation 17(2) requires Water Service to investigate whether a failure to achieve the prescribed concentration or value may be attributable to the domestic distribution system or its maintenance, or neither.
- 6.8 Bacteriological parameters may be influenced by the condition of the domestic distribution system and particularly the design and hygienic status of the consumer's tap. Where a failure to achieve the prescribed concentration for Enterococci and *E. coli*, occurs Water Service should investigate the cause by taking further samples which may include:
- the original sample point;
 - alternative consumer taps (only taps directly connected to the supply main) at the same property and at adjacent or nearby properties; and
 - further sampling from related points in the distribution main.
- 6.9 Additional information may be obtained by:
- reviewing the outcome of analysis from other samples that may have been taken from related water supply areas at a similar time to the original sample;
 - taking a sample prior to and after disinfection of the consumer tap; and
 - taking a swab sample from the surfaces of the tap that come in contact with the water supply.

- 6.10 the outcome of the further analysis provides important information on the likelihood that the failure to achieve the prescribed concentration is attributable to the domestic distribution system. There is a strong indication that the failure is attributable to the domestic distribution system in any of the following circumstances:
- (i) the failure to meet the prescribed concentration recurs at the original consumer's sample tap but all other samples meet the relevant prescribed concentrations;
 - (ii) the failure to meet the prescribed concentration recurs in a sample taken before disinfection of the original consumer's sample tap but a sample taken following disinfection meets the relevant prescribed concentrations, and all other samples meet the relevant prescribed concentrations;
 - (iii) the failure to meet the prescribed concentration does not recur at the original consumer's sample tap, but Enterococci or *E. coli* are recovered from a swab sample taken from the surfaces of the tap, and all other samples meet the prescribed concentrations; or
 - (iv) the exceedence is clearly attributable to an upstream device, e.g. softener, filter or point of use treatment device or from some other unit connected to the domestic plumbing, e.g. washing machine or dishwasher.
- 6.11 Where Water Service can demonstrate that failures to meet the prescribed concentrations for Enterococci or *E. coli* were likely to be attributable to the domestic distribution system, and then the individual results on the public record should be qualified by appropriate comments.
- 6.12 Failures to achieve the prescribed concentration for copper, lead and nickel at the consumer's tap are commonly associated with the domestic distribution system as the water interacts with copper or lead pipes (or solders) and brass fittings which contain nickel. Water Service should investigate the extent of these interactions by taking additional 'unflushed' samples following defined periods of stagnation and from nearby properties.
- 6.13 Failure to achieve the prescribed concentration for copper may occur in houses with new copper plumbing or where a significant amount of copper pipe has been replaced. Following a failure to achieve the prescribed concentration for copper, the domestic distribution system should be inspected to ensure that it meets the requirements of the Water Regulations (Northern Ireland) 1991.
- 6.14 Unless Water Service can demonstrate that the failure to achieve the prescribed concentration for copper or lead was due to exceptional circumstances and was therefore unlikely to recur, regulation 17(9) requires Water Service to modify or replace its pipes or fittings that have potential for contributing to copper or lead in the water supplied to the premises.

- 6.15 Between 25 December 2003 and 25 December 2013, the Regulations require Water Service to modify or replace its pipework when a sample exceeds 25µg/l. In addition to these requirements, regulation 29 contains additional requirements for Water Service regarding lead pipe replacement. Up until 25 December 2013, when a sample is between 10 and 25µg/l and a request is received from the consumer who has replaced his/her pipework, Water Service is required to replace its pipework. The Inspectorate encourages Water Service to continue to use its discretion, to replace its lead pipework where a sample exceeds 10µg/l. After 25 December 2013, any sample that exceeds 10µg/l requires Water Service to replace its pipework irrespective of whether or not the owner replaces his/hers.

Further guidance on the lead parameter is given in paragraphs 7.8 to 7.12.

Regulation 17(3) – Exceedence of Authorised Departure Value

- 6.16 Where a departure has been authorised and a sample fails or is likely to fail to meet the concentration or value required by the authorisation, Water Service shall immediately take steps as are necessary to identify the following:
- cause and extent of failure; and
 - whether failure is attributable to the domestic distribution, its maintenance or other reasons.

Regulation 17(5) – Notification of Failure, or Likely to Fail

- 6.17 Regulation 17(5) requires Water Service to notify the Department (in practice, DWI) ‘**as soon as maybe after**’ the investigations regarding the cause and extent of failure have been completed. The Inspectorate’s information requirements are contained within Appendix 2.

Regulation 17(6) - Notification to Consumers

Notices to Consumers

- 6.18 Regulation 17(6) requires Water Service, when it has identified by its investigation that a failure is due to the domestic distribution system or to the maintenance of that system, to notify ‘**affected**’ consumers, in writing, of the nature of the failure and to relay steps (if any) that Water Service or health authorities consider desirable for the consumers to take in the interests of their health. Water Service should provide appropriate technical advice and may refer consumers to their Environmental Health Officers or Health and Social Services Boards for advice on health matters. ‘Affected’ consumers is not defined in the regulations. Where the failure is regarding lead, the Inspectorate has defined ‘affected’ as the number of properties as referenced by the last two letters of a postcode. For practical purposes, Water Service should take into consideration the specific location circumstances of where the lead exceedence occurred and notify the ten most adjacent properties.

Where a sample has been collected for the purposes of mains rehabilitation zonal studies or for customer complaints / request purposes, and the sample exceeds, the 'affected' consumers requiring notification under these circumstances will be taken to mean the specific house where the sample was lifted.

6.19 The notification from Water Service should inform the consumer in simple layman's terms of:

- (i) the parameter that has failed;
- (ii) the concentration or value of that parameter in the sample taken from the consumer's premises;
- (iii) the prescribed concentration or value of that parameter;
- (iv) the significance of the failure (e.g. if Water Service considers that advice on health matters should be sought); and
- (v) the reason for the failure.

6.20 The notification must also inform the consumer of the steps he/she should take. These steps will depend on the nature of the parameter and the cause of the failure. Examples of the steps that Water Service may consider are:

- (i) **failures of microbiological parameters**
 - if necessary, following discussion with health authorities, advise that water be boiled for drinking and food preparation
 - a plumbing inspection may assist in the investigation
 - where the failure is associated with an individual fitting, advise of repair or replacement of the pipework or fitting causing the problem.
- (ii) **failures of the lead parameter (or other plumbing metals)**
 - advise drawing off the water standing in the pipework and using for purposes other than drinking or food preparation
 - advise consideration of replacing the pipework within the premises contributing to the failure
- (iii) **failures of other parameters** are likely to be caused by ingress to the pipework within the consumer's premises (by permeation, leaking pipes or back siphonage)
 - if necessary, following discussion with health authorities, advise that water be boiled for drinking and food preparation, or not to use water for drinking and food preparation
 - advise a plumbing inspection
 - where the failure is associated with an individual fitting, advise of repair or replacement of the pipework or fitting causing the problem

Regulation 18 – Investigations: Indicator Parameters

- 6.21 The Inspectorate will be notified electronically by Water Service where the specification for indicator parameters has not been met, as soon as the result is known.
- 6.22 The information reporting requirements are contained within Appendix 2.
- 6.23 In addition, Regulation 34 (8 and 9) requires Water Service to notify the Inspectorate of the occurrence of any event which gives rise, or is likely to give rise, to a significant risk to health. Events and incident reporting procedures are contained within Appendix 4.
- 6.24 Regulation 18(1) requires Water Service, when it has reason to believe that the water supplied does not meet the specification for indicator parameters, to investigate why the specifications were not met, whether the cause was the domestic distribution system or the maintenance of that system or neither. Such an investigation must be carried out when a sample, taken in accordance with the Regulations, does not meet the specification for an indicator parameter. Investigation should also be carried out when an operational sample or a sample taken to investigate a consumer complaint does not meet the specification for an indicator parameter.
- 6.25 Regulation 18(2) requires Water Service ‘**as soon as maybe after**’ its investigations are complete, to notify the Inspectorate of results of the investigations and whether the inability to meet the specification is likely to recur.
- 6.26 If a particular parameter for a particular water supply zone or group of water supply zones supplied by the same water treatment works does not meet the specification for indicator parameters, and Water Service notifies the Inspectorate that it has not met the specification, and the inability to meet it is likely to recur, then Water Service needs not investigate and notify on each subsequent occasion that the specification is not met, provided it is clear that the cause is the same and there are no changes in circumstances. If it is likely that the cause is different or there has been a change in circumstances, Water Service must carry out the investigations and the notification. This paragraph only applies to those indicator parameters that are unlikely to be affected by the domestic distribution system or the maintenance of that system – chloride, *Clostridium perfringens* (including spores), conductivity, sulphate, total indicative dose (for radioactivity), total organic carbon (TOC), tritium (for radioactivity), and turbidity.
- 6.27 All occasions when the specifications for the ammonium, coliform bacteria and colony counts parameters are not met at consumers’ taps must be investigated, in particular, to determine whether the inability to meet the specification is due to the domestic distribution system or the maintenance of that system. When it is due to the domestic distribution system, Water Service must notify the affected consumers and inform them of the nature of the problem and any steps that Water Service or the health authorities consider desirable for the consumers to take in

the interests of their health. Water Service should provide appropriate technical advice and may refer consumers to their local Environmental Health Officers or health and social services board, for advice on health matters. For the microbiological parameters, that advice could be to boil water for drinking and food preparation and to get a plumbing inspection to identify the cause of the problem and to rectify the cause.

- 6.28 The national dilution numbers standards of 3 for taste and odour are action levels at which further work should be initiated to investigate the cause of the deterioration. When background levels of taste and odour are low and changes in levels are small, use of the Standing Committee of Analyst's dilution number methods is appropriate. Most waters will exhibit no or very low taste and odour. Water Service should establish the baseline level of taste and odour in each distribution system, including, where appropriate, the seasonal variations. Dilution number methods are not a useful technique if a qualitative assessment of an unexpected odour is required. All taste and odour consumer complaint samples should receive a qualitative taste and odour test, and, where appropriate, additional tests should be undertaken to characterize the intensity and/or source of the taste or odour.

Regulation 19 – Action by the Department of the Environment (in practice, DWI)

- 6.29 Where DWI is satisfied that a contravention is not trivial, and Water Service has not taken, or initiated, adequate action to prevent a recurrence, the Inspectorate will send Water Service a letter indicating that consideration is being given to the making of a formal notice (details of this process are contained in Appendix 3).
- 6.30 Regulation 19(1) permits DWI to require Water Service to seek an Authorised Departure following a non-trivial failure in respect of a Schedule 1 parameter that is likely to recur. Authorised Departures are not permitted for the *E. coli* and Enterococci parameters and DWI may serve a **notice** to Water Service to take such steps (as may be determined) following non-trivial failures that are likely to recur.
- 6.31 DWI will proceed with a **notice** where the extent of any failure of any other Schedule 1 parameter constitutes a potential danger to human health.
- 6.32 Regulation 19(4) permits DWI to require Water Service to take steps following a notification from Water Service (under regulation 18(2)) that there is a continued inability to meet the specification of an indicator parameter. Steps only need to be taken where the inability to meet the specification poses a risk to health. DWI may consider it necessary to serve a **notice** under these circumstances.
- 6.33 Most indicator parameters do not have a direct influence on health but are included in the monitoring programme because they may indicate a problem, or potential problem, with the treatment or distribution of drinking water. In all cases, exceedence of an indicator parameter value must be followed by an investigation by Water Service. In many cases, a change in the level of indicator parameter may be more significant than the exceedence of a particular value. The

nature of the raw water source in many cases, may influence the significance of changes and exceedences of indicator parameters values.

- **Ammonium** (specification: 0.50mgNH₄/l)

The presence of ammonium in raw waters is usually associated with organic contamination (animal waste and sewage) of surface waters or from the desorption of ammonium within anaerobic groundwaters. The exceedence of the indicator value in treated waters usually indicates that treatment of anaerobic groundwater or contaminated surface water has failed. The presence of ammonium in raw water may also compromise the efficiency of chlorination and, therefore, investigations into the exceedence of the indicator parameter value should include checks to establish the adequacy of disinfection. Unpleasant tastes and odours may be associated with high concentrations of dichloramine and trichloramine that may be caused by high concentrations of ammonium. In some cases, elevated concentrations of ammonium may be associated with cement-mortar pipe linings.

- **Chloride** (specification: 250mgCl/l)

The presence of chloride in raw waters results from diverse inputs which include leaching from soils, sewage or industrial discharges, run-off from de-icing and saline intrusion. In the later two cases, there is also an associated increase in the concentration of sodium. Increased chloride content may also increase the aggressivity of water. In rare cases, increases in the concentration of chloride have been associated with contamination by sodium chloride used as a regenerant for the ion-exchange removal of nitrate. As the concentration of chloride increases above the indicator concentration, it is likely that there will be an increasing detection of taste by consumers. Typical taste thresholds are between 250 and 300mg/l.

- ***Clostridium perfringens*, including spores** (specification: 0/100ml)

Clostridium perfringens are commonly found in human and animal faeces. As *Cl. perfringens* is generally present in faeces in much lower numbers than *E. coli* and Enterococci, it is a less sensitive as an indicator of faecal contamination. The spores of *Cl. perfringens* are capable of surviving for significantly longer periods than vegetative bacteria such as coliforms or Enterococci. *Cl. perfringens* are removed from water by coagulation and filtration, but the spores of these bacteria can be resistant to chlorine at the concentrations normally used in water treatment. Low numbers may occasionally occur in water supplies, but their presence (in the absence of other faecal indicators) does not represent a risk to health. The main value of monitoring for *Cl. perfringens* at a point where the water leaves the water treatment works is to assess the efficiency of the treatment process. The presence of *Cl. perfringens* in treated water derived from groundwaters could indicate bacteriological contamination of the source. A change in the number of *Cl. perfringens* in treated water against the normal range for that supply is more significant than the exceedence of a particular value. Investigations into the

exceedence of the indicator value should include checks to establish the quality of the source and the adequacy of disinfection.

- **Coliform bacteria** (specification: 0/100ml)

Coliform bacteria are a diverse group known to be present in soil, environmental waters and other environmental materials. Some members are also capable of growth in nutrient rich water and biofilms. As a result they are not considered to be specific indicators of faecal contamination. A few members of the coliform group can be associated with human infection as opportunistic pathogens or as hospital acquired infections. Whenever coliforms are isolated from a drinking water supply investigations need to be carried out to establish the source of contamination. Coliforms detected from samples taken within consumers' premises may be associated with domestic distribution systems such as kitchen taps and sinks. Other potential sources of coliforms in water supplies are sub-optimal operation of water treatment processes or ingress of contamination from breaches in the integrity of the distribution system (via hatches on service reservoirs, air valves, stop valves, cross connections and backsiphonage). In some cases additional information on the identity of coliform species present may prove useful in determining the sources and significance of the coliforms detected. Low numbers may occasionally occur in water supplies, but their presence (in the absence of other faecal indicators) does not represent a risk to health.

- **Colony counts** (specification: no abnormal change)

Colony counts are enumerations of the general population of heterotrophic bacteria present in a water supply. In environmental waters these represent bacteria whose natural habitat is the water environment or those that may have been washed from soil or vegetation. It is well recognized that only a small fraction of the viable heterotrophic bacteria population is estimated by enumeration on nutrient rich media with incubation at 22°C and 37°C. However, monitoring of water supplies for colony count bacteria can be useful for monitoring trends in water quality and detecting potential sudden deterioration in water quality. The colony count at 22°C generally represents those bacteria naturally present in water and is not of sanitary significance. They may, however, be of greater relevance to the food and drinks industries where high numbers may impact on the quality of products. An increase in the colony count at 37°C can be a sensitive indicator of ingress and further investigations should be undertaken to establish the source. Colony counts may be useful in assessing the efficiency of water treatment and the cleanliness and integrity of the distribution system. In all cases the value of monitoring is to establish data which characterizes a water supply in terms of seasonal and longer term changes. Drinking water supplies derived from surface waters tend to support higher numbers of heterotrophic bacteria than those derived from groundwater sources. The onset of significant change in colony count results against the normal range established for that water supply is much more significant than the absolute values of individual results.

- **Conductivity** (specification: 2500 $\mu\text{S}/\text{cm}$ at 20°C)

Conductivity is a measure of the extent of dissolved inorganic ions that are present. It is a non specific measurement and although a high value may indicate an undesirable high concentration of ions. Increased values of conductivity in samples taken from consumer premises may indicate potential backflow or cross connections. A change in the concentration of conductivity against the normal range for that water supply is more significant than exceedence of a particular value. Further investigation and analysis is required to identify the predominant elements present. All of the significant individual elements have either standards or indicator values against which the need for action can be assessed.

- **Hydrogen ion** (specification: pH 9.5)

This parameter has in addition a mandatory maximum value of pH 10.0. DWI considers that this is an appropriate action value. Although exceedence of the mandatory maximum value may not pose a direct risk to health, it may, depending on the buffering capacity of the water, increase the solubility of metals and may adversely impact the aesthetic quality.

- **Sulphate** (specification: 250mgSO₄/l)

High concentrations of sulphate may affect the taste of a water supply and there is also some evidence to suggest that it may have a laxative effect in vulnerable groups such as bottle fed infants. For these reasons DWI considers that Water Service should take further actions to investigate the origin of concentrations that exceed the indicator value.

- **Total organic carbon** (specification: no abnormal change)

Total organic carbon is a non specific index of the organic material in a water supply. The significance of an increase in the concentration of total organic carbon will require further investigation. In some cases the increase may be associated with increases in the concentration of assimilable organic carbon. As assimilable organic carbon provides a potential nutrient source for bacteria, Water Service should investigate whether there is increased potential for the growth of biofilms.

- **Total Indicative Dose (TID)** (for radioactivity, specification: 0.10 mSv/year)

Where monitoring is being undertaken the level of gross α activity should be assessed against a screening level of 0.1 Bq/l and the level of gross β activity assessed against a screening level of 1 Bq/l. If either screening value is exceeded additional analysis should be undertaken to establish which radionuclides are present. The range of radionuclides analysed should take into account relevant information on potential sources. The total indicative dose (TID) is then calculated from the individual isotope concentrations excluding any activity from

tritium, potassium-40, radon and radon decay products. If the TID exceeds the indicator value of 0.10 mSv/year appropriate medical advice should be sought. The specification for TID is expressed in terms of the dose over a year. In interpreting the results of radioactivity monitoring it is necessary to take into account the variability of the activity levels over time. Some water sources are likely to show seasonal variation due to natural processes. In addition, any short term increase in radionuclides that may result from radiological incidents should be assessed against guidance for food and liquids within Guidance published by the former Department of the Environment (Civil Emergencies involving radioactive substances.) See also paragraphs 4.17-4.30 and Appendix 7.

- **Tritium** (specification: 100 Bq/l)

Tritium is naturally present in the environment but only at very low concentrations. Tritium can also be an indication of contamination from artificial sources and Water Service should take actions to investigate the source of any exceedence of the indicator value. If the indicator value is exceeded additional analysis should be undertaken to establish which isotopes are present and the total indicative dose calculated from the individual isotope concentrations. If the total indicative dose exceeds the indicator value of 0.10m Sv/year appropriate medical advice should be sought. The specification for total indicative dose is expressed in terms of the dose over a year. In interpreting the results of radioactivity monitoring it is necessary to take into account the variability of the activity levels over time. Some water sources are likely to show seasonal variation due to natural processes. In addition, any short term increase in radionuclides that may result from radiological incidents should be assessed against guidance for food and liquids within Guidance published by the former Department of the Environment (Civil Emergencies involving radioactive substances). See also paragraphs 4.17-4.30.

- **Turbidity** (specification: 1 NTU)

The indicator value only applies at the treatment works. For this parameter there is in addition a mandatory maximum value of 4 NTU that applies at the consumers' tap. Exceedence of the indicator parameter value does not represent a direct risk to human health. Significant increase in the level of turbidity may compromise the effectiveness of disinfection. The World Health Organization has issued guidance on the level of turbidity required to allow satisfactory disinfection. The importance of optimizing 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. DWI considers that any exceedence of the indicator value 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.

6.34 A summary of the investigations for Schedule 2 indicator parameters is given in Appendix 6.

Regulation 20 – Authorisations of a Temporary Supply of Water that is not Wholesome

- 6.35 Regulation 20 allows the Department (in practice DWI) to authorise a departure from the provisions of Part III of the 2002 Regulations upon written request from Water Service. Authorised Departures are only applicable for Schedule 1 parameters and will only be granted where the extent of the departure does not constitute a risk to human health.
- 6.36 The information that shall be provided with an application for an Authorised Departure is detailed in Regulation 20(3). The application must be copied to every appropriate district council and health and social services board, who have 30 days to make any representations on the application.
- 6.37 Where DWI considers that the failure to meet the prescribed concentration is trivial and that the PCV will be met within 30 days a shortened application as specified in Regulation 21(4) is required. The period of 30 (working) days begins with the day on which the parameter was contravened, this means in effect, the date that the sample was collected.
- 6.38 An Authorised Departure may be granted for a maximum of three years and in each case will specify the extent to which any parameter may depart from the PCV specified in Schedule 1. Where DWI considers that it is not possible to restore a wholesome water supply within three years Water Service is required to apply for a further departure. DWI proforma for applications for Authorised Departures is provided in Appendix 8.

PART VII

WATER TREATMENT

Regulation 25 – Interpretation: Definition of Spring

- 7.1 The Interpretation confirms that ‘surface water’ does not include water from a spring. In the context of regulation 26, a spring is regarded as underground water arising at the surface, under its own head, at the outcrop of the junction between impermeable and permeable strata. The quality of water from springs can be variable. Water derived from springs that issue from deep-seated aquifers can be of good quality, whilst water arising from perched water tables or supported by fissure flows is more variable.

Regulation 27 - Risk Assessment for *Cryptosporidium*

- 7.2 Regulation 27 introduces a requirement to undertake an annual risk assessment at all of its water treatment works. Water Service is required to submit to DWI a report of that assessment by 1 October each year, which sets out the results of the assessment and a statement that the assessment established that there is a significant risk from *Cryptosporidium*, or that there is no such risk. The risk assessment should be undertaken according to the Guidance on assessing the risk from *Cryptosporidium* oocysts in treated water supplies, to satisfy the ‘Guidance for Monitoring of *Cryptosporidium* in Treated Waters in Northern Ireland, May 2002, Revised February 2003’ which is available on the website:
<http://www.ehsni.gov.uk/environment/drinkwater/links.shtml>

***Cryptosporidium* Monitoring Requirements**

- 7.3 Monitoring requirements to establish the concentrations of *Cryptosporidium* oocysts are contained within the Guidance document. Details of the approved collection devices, approved sampling equipment, approved analysis and approved laboratories are given in the Guidance document in the Standard Operating Protocols (SOPs). The DWI for England and Wales maintains these protocols, the most recent versions of the SOPs are available on the website:
<http://www.dwi.gov.uk/regs/crypto/amendments.htm>

***Cryptosporidium* Reporting Requirements**

- 7.4 Water Service is required to notify DWI of the results of *Cryptosporidium* monitoring in accordance with the reporting procedures contained within the Guidance Document.

Regulation 28 - Procedure Following Risk Assessment

- 7.5 Regulation 28 details the procedures following the risk assessment. Should DWI consider the risk assessment unsatisfactory, Water Service shall be notified and required to submit a further risk assessment report by a specified date.

Regulation 29 - Contamination from Pipes

- 7.6 Regulation 29 deals with contamination of the water supply by copper or lead as a result of the supply and domestic pipework. Further guidance on the way in which Water Service should develop their plumbosolvency (and cuprosolvency if appropriate) treatment and control strategies has been provided in the Drinking Water Inspectorate for England and Wales Information Letters 12/2000 and 3/2001. (DWI NI letter of 15 February 2001 incorporates these Information Letters). The risk (the prescribed risk) relates to the supply of water to any individual premises and arises when copper or lead is the major component of the service pipe.
- 7.7 Regulation 29(4) requires Water Service to modify or replace its part of any lead service pipe when it has reason to believe that the concentration of lead at the consumer's tap exceeds 10µg/l. Between 25th December 2003 and 25 December 2013, the Regulations require Water Service to modify or replace its pipework when a sample exceeds 25µg/l. In addition to these requirements, regulation 29 contains additional requirements for Water Service regarding lead pipe replacement. Up until 25 December 2013, when a sample is between 10 and 25 µg/l and a request is received from the consumer who has replaced his/her pipework, Water Service is required to replace its pipework. The Inspectorate encourages Water Service to continue to use its discretion, to replace its lead pipework where a sample exceeds 10µg/l. After 25 December 2013, any sample that exceeds 10µg/l requires Water Service to replace its pipework, irrespective of whether the owner replaces his/hers or not.

Further Guidance on the Lead Parameter

- 7.8 Regulation 17(9) applies to failure of the lead standard in force at that time. On that basis, the trigger for action under this Regulation relates to 25µg Pb/l until 25 December 2013, at which time the trigger will reduce to 10µg Pb/l.
- 7.9 Any compliance, random daytime survey or samples taken specifically at the request of consumers, but excluding samples taken for research or operational purposes particularly those involving stagnation sampling techniques, which exceeds 25µg Pb/l at a consumer's tap should trigger the obligation to replace lead communication pipes.
- 7.10 Where a relevant sample is taken which triggers a potential obligation under regulation 17(9) a simple follow up investigation should occur. This would include as a minimum:
- (i) a check to see whether a Water Service lead communication pipe is present;
 - (ii) identification of any special factors e.g. very long consumer lead pipe; and
 - (iii) a repeat sample based on either random daytime sampling or 30 minutes stagnation as deemed appropriate in the circumstances.

- 7.11 If the second sample also exceeds 25µg Pb/l or there are particular high risk factors which mean that 25µg Pb/l is likely to be exceeded in the future then the Water Service will undertake the following actions:
- (i) institute a replacement of its part of the lead service pipe; and
 - (ii) notify the customer of the situation in writing.
- 7.12 Immediate action will not be required if the lead communication pipe to that property is scheduled to be replaced as part of an agreed strategic programme within the next three months or where a mains rehabilitation programme is planned within the next three months and any lead communication pipes would be replaced as part of that work.

Regulation 30 - Application and Introduction of Substances and Products

- 7.13 Regulation 30 specifies the circumstances in which Water Service may apply or introduce substances or products into water supplied for drinking, washing, cooking or food preparation. Paragraphs (3) and (3)(a) refer to appropriate CE marking and other appropriate European technical specifications. Paragraph (3)(b) lists equivalent national measures that may be considered in the absence of European specifications. Paragraph (3)(i) requires Water Service to adhere to national conditions of use that apply to substances and products applied or introduced under (3)(a) and (b). Paragraph (3)(ii) confirms that the UK will comply with the requirements of the 98/34/EC Directive on the notification of national conditions of use as new technical requirements.
- 7.14 Regulation (30)(2) provides for the use of substances and products approved by the Secretary of State under regulation 31(4) of the Water Supply (Water Quality) Regulations 2000, which apply in England and Wales. A copy of the Secretary of State's list can be obtained from: www.dwi.gov.uk/cpp/index.htm

Regulation 31 - Use of Processes

- 7.15 Regulation 31 provides for the Department (in practice, DWI) to give notice to Water Service, requiring it to make an application for approval of any process. The notice may also prohibit use of the process for a specified period. Regulation 31 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.

Further Guidance on the Application and Introduction of Substances and Products, Use of Processes and Other Specific Issues

- 7.16 Further Guidance on the application and introduction of substances and products; use of processes; and other specific issues, is available in the document "Guidance on the Water Supply (Water Quality) Regulations 2000 (England) and "Guidance on the Water Supply (Water Quality) Regulations 2001 (Wales)

prepared by DWI for England and Wales. This is available on www.dwi.gov.uk/regs/pdf/interim2003.pdf

PART VIII

RECORDS AND INFORMATION

Regulation 33 - Maintenance of Records

- 8.1 Regulation 33 details the information to be provided in the public record. The public record, which may be in hard copy or electronic format, should be made available to the public within at least one of the Water Service's offices, at reasonable office hours. The entries for the results of compliance analysis should be reported in the units of the Regulations.

Regulation 34 - Provision of Information

- 8.2 Regulation 34 specifies the information to be supplied to the appropriate district council. The regulation requires Water Service to provide information on the results of analysis of samples taken from water treatment works, service reservoirs, supply points and water supply zones that relate to the quality of water supplied to premises in the district council's area.
- 8.3 Information should be provided as a summary for each water treatment works, service reservoir, supply point and water supply zone. The format of information is not specified and Water Service is encouraged to liaise with its respective local authorities to develop systems of reporting that are acceptable. It is envisaged that Water Service may agree to supply the information in either hard copy or an agreed electronic format. Details of the type of information required by regulation 34 are summarized in Appendix 9.
- 8.4 In order to facilitate the interpretation of the information provided for supply points, Water Service should provide details of the relationships between the supply points and the water supply zones to which they relate.
- 8.5 The need to report the mean concentrations for microbiological parameters has not been retained in the Regulations. This would facilitate the use and reporting of presence/absence testing for microbiological parameters at weekends and bank holidays.

Regulation 35 - Publication of Information

- 8.6 Regulation 35 specifies the information to be provided in the annual report. The format of the report is not specified to allow Water Service to adopt reporting formats that are readily informative. DWI considers that making the report accessible in an electronic format may fulfil the requirement for publication. The regulation also requires copies of the report to be sent to the relevant district council. DWI considers that copies of the report could be sent in electronic format.
- 8.7 In contrast to the information to be provided to district councils, the annual report is a summary of the total numbers of samples taken at all water treatment works,

all service reservoirs, all supply points and all water supply zones. It should also include the number and percentage of samples that fail to meet the relevant PCV and the value specified in an authorised departure. In the case of indicator parameters, the number of samples that exceed the indicator parameter value shall be recorded. Details of the type of information required by regulation 35 is summarized in Appendix 10.

REGULATION 16 – ANALYSIS OF SAMPLES**A1 Training of Analysts**

- A1.1 Water Service or its 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, and 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, results of any audits, any retraining or further training given and any re-assessment of competence.

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 (England and Wales) website: www.dwi.gov.uk
- A2.3 Subparagraph (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 Subparagraph (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 Department for that purpose.

A3 Initial Performance Testing

A3.1 Each laboratory or field testing organization 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 to, 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 to:
- estimate the within-laboratory total standard deviation of individual analytical results for blanks, standard solutions, samples and spiked samples on at least five 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 means that spiking recovery and standard deviation of spiking recovery should also be determined.
- A3.7 Wherever possible, the range of the standard solutions tested should include the regulatory prescribed concentration or value, 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 five 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 total 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. 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 recognized 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 two batches may be analysed on any one day. When two 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) 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 three 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, 1995 (The AQC Guidelines), pages 649-666.

A3.25 When an analytical method has been in continuous use for several years, typically between three and five 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 requirement, 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 $PCV \pm 25\%$. The PCV for a determined constituent of a parameter is the PCV for the parameter. The frequency of use of control solutions will vary according to the particular analytical technique used, but normally between five and twenty percent of all samples analysed should be control solutions, 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 requirement, 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 organization 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 (England and Wales).
- A4.9 The laboratory or other organization 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.

A5.2 Guidance on the suitability of a scheme is given in "The International Harmonised Protocol for the Proficiency Testing of (Chemical) Analytical Laboratories", M Thompson, R Wood, Journal of AOAC International, Vol 76, No 4, 1993.

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 organization or person carrying out regulatory analysis in the definition of a laboratory. This includes all analyses carried out as field tests.

A7 Regulation 16(4) - Retention of Records

A7.1 This regulation requires Water Service 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;

- (ii) 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 Subparagraph (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 A2 and B2 respectively in the publication 'The Determination of Taste and Odour in Potable Waters 1994' in the series 'Methods for the Examination of Waters and Associated Materials' (HMSO) should be used, omitting the intermediate screening steps in A2.8.2 and B.2.9.2. 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 on 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 of 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 Water Service 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:

Trueness	The greater of 10% of the result or 0.05mg Cl/l
Precision	The greater of 10% of the result or 0.05mg Cl/l
Limit of Detection	0.05mg 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.

(ii) Total Organic Carbon (TOC)

Trueness	The greater of 10% of the result or 0.25mg C/l
Precision	The greater of 10% of the result or 0.25mg C/l
Limit of Detection	0.5mg C/l

All Other Parameters

A8.7 The performance requirements are given in Table A2 of 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;
- (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.

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 of 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% of the PCV (200µg/l). This equates to an absolute value of 20µg/l at the PCV. The target for concentrations less than 100µg/l (one half of the PCV) is one half of this, 10µg/l (standard deviation 5µg/l). For all concentrations above 100µg/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

Limit of Detection

Target 25% of PCV, i.e. for bromate 2.5ug/l. Calculated as 5 x within batch SD for blank or 3 x within batch SD of a natural 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 1.25ug/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 1.25ug/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.)

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 cutoff 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

LOD	Maximum Permissible LOD	RL^{1,2}	Reason Given for Adopting RL
0.31	2.5	2.5	Equals maximum permissible LOD and will not need revising if LOD changes.
0.65	1	2	Set as a common RL for all determinands in the analysis suite.

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 oxidized 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

LOD	Number of Decimal Places Reported for Results Close to the LOD ^{3,4}	Appropriate RL
0.141	3	0.141
0.141	2	0.15
0.141	1	0.2

- 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) – Specific Methods

- A11.1 Where a method of analysis is specified in Table A1 of Schedule 4, laboratories must use the prescribed 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 Water Service.
- A11.2 A laboratory wishing to use an alternative method that has not been approved must first make 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 2002'. 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.

Further sources of relevant information are:

- 'Guidelines for Calibration in Laboratories', which is available on the DWI website: www.dwi.gov.uk
- 'A Manual of Analytical Quality Control for the Water Industry' (NS30).
- 'Harmonized Guidelines for Internal Quality Control in Analytical Chemistry Laboratories' ISO/IUPAC/AOAC, Pure and Applied Chemistry, Vol 67, No 4, 1995 (The AQC Guidelines), pages 649-666
- 'Guidance on the Interpretation of Aspects of Analytical Quality Control (AQC).'
- 'The International Harmonized Protocol for the Proficiency Testing of (Chemical) Analytical Laboratories.' M Thompson, R Wood, Journal of AOAC International, Vol 76, No 4, 1993.
- 'The Determination of Taste and Odour in Potable Waters, 1994' in the series 'Methods for the Examination of Waters and Associated Materials' (HMSO).
- 'Quality Control Charts in Routine Analysis.' Gardner M J, Water Research Centre, November 1996, WRc Ref: CO 4239.
- BSi Draft for Development 'Water Quality – Guide to Analytical Quality Control for Water Analysis.' BSi Ref: DD ENV ISO 13530:1999 (CEN Ref: ENV ISO 13530:1998 E. ISO Ref: ISO/TR 13530:1997(E)).

INFORMATION REQUIREMENTS RELATING TO EXCEEDENCE REPORTING, MONTHLY COMPLIANCE REPORTING AND OTHER REPORTING MATTERS

Definitions:

'the 2002 Regulations' – means the Water Supply (Water Quality) Regulations (Northern Ireland) 2002.

'compliance samples' – means all samples lifted for compliance monitoring purposes as contained within Schedule 1 and Schedule 2 to the 2002 Regulations.

'operational control samples' – means all samples collected and brought into the laboratory for analyses, for the purposes of operational control.

'non-regulatory samples' – means all operational samples, consumer complaint samples and samples lifted as part of the mains rehabilitation zonal studies.

'Water Service' - means the board level contact (Water Service Standards and Regulations Directorate) or person otherwise designated by Water Service.

1 Provision of Information Where a Standard has been Contravened

1.1 Immediate Notification Requirements Once a Standard has been Contravened for Compliance Monitoring Purposes

Water Service shall, in respect of any samples taken under Parts IV and V of the 2002 Regulations, which exceed the prescribed concentration or values of any parameter listed in Schedule 1 or the specification of any indicator parameter listed in Schedule 2, or where an authorised departure value granted under Part VI of the 2002 Regulations has been exceeded provide the Drinking Water Inspectorate with a report of the exceedence with the following information:

- (a) the site reference and identifier number from where the sample was taken (water supply zones, service reservoirs/water towers, water treatment works and water supply points);
- (b) location address where the sample was taken from a water supply zone;
- (c) the date the sample was taken;
- (d) sample reference number
- (e) the parameter concerned;

- (f) the numerical result;
- (g) the units of measurement; and
- (h) whether the sample point refers to a supply point.

1.2 Provision of Exceedence Investigation Information Relating to Non-compliance with the 2002 Regulations

Water Service shall, in respect of any samples taken under Parts IV and V of the 2002 Regulations, which exceed the prescribed concentration or values of any parameter listed in Schedule 1, or the specification of any indicator parameter listed in Schedule 2, or where an authorised departure value granted under Part VI of the 2002 Regulations has been exceeded, provide the Drinking Water Inspectorate with a report '**as soon as maybe after**' the investigations have been carried out, of the exceedence with the following information:

- (a) site reference and identifier number from where the sample was taken;
- (b) sample reference number;
- (c) details of the investigations carried out under Part VI of the 2002 Regulations; and
- (d) Water Service's opinion whether the exceedence is likely to recur.

1.3 Provision of Monthly Exceedence Information Relating to Non-regulatory Samples

Water Service is required to provide monthly information relating to non-regulatory sample exceedence reporting (such as for operational control, consumer complaints and mains rehabilitation zonal studies) in respect of any parameter listed in Schedule 1 or the specification of any indicator parameter listed in Schedule 2, on or before 21 March 2004 for samples taken during January 2004 and on 21st day of each subsequent month.

The monthly summary report should provide the following information:

- (a) site reference and identifier number;
- (b) location address where the sample was taken from a water supply zone;
- (c) the date the sample was taken;
- (d) sample reference number;

- (e) the parameter concerned;
- (f) the numerical result;
- (g) the units of measurement; and
- (h) whether the results exceeded an authorisation under Part VI of the 2002 Regulations.

1.4 Provision of Exceedence Investigation Information Relating to Non-regulatory Sample Reporting

In relation to non-regulatory sample exceedences, Water Service is required to provide the Drinking Water Inspectorate with a report of the investigations that have been carried out of the exceedence, with the following information:

- (a) site reference and identifier number;
- (b) sample reference number;
- (c) details of investigations carried out under Part VI of the 2002 Regulations; and
- (d) Water Service's opinion as to whether the exceedence is likely to recur.

2 Provision of Monthly Summary Information Relating to all Compliance Samples (Schedule 1 and Schedule 2 Parameters)

Water Service is required to provide monthly summary information relating to all compliance samples in respect of any parameter listed in Schedule 1, or the specification of any indicator parameter listed in Schedule 2, on or before 21 March 2004 for samples taken during January 2004 and on 21st day of each subsequent month.

3 Provision of Information Relating to Compliance with Regulations 34 (8 and 9)

Events/Incident Samples

Water Service is required to provide the information as required in the Guidance Letter 'Information to be provided in Initial and Final Reports on Water Quality Events and Other Matters – Regulation 34 (8 and 9)', Appendix 4 refers.

Our Ref: DWI 101/04

Date: 27 September 2004

To: Water Service Board Level Contact, Standards and Regulation Directorate

IMPLEMENTATION OF THE WATER SUPPLY (WATER QUALITY) REGULATIONS (NORTHERN IRELAND) 2002 – INITIATION OF FORMAL NOTICE ACTION OF CONTRAVENTIONS OF REGULATIONS 17 AND 18

Purpose

- 1 The purpose of this letter is to inform Water Service of the process that the Inspectorate will operate to initiate formal notice action of contraventions of Regulations 17 and 18 of the Water Supply (Water Quality) Regulations (Northern Ireland) 2002.

Background

- 2 Regulation 17(1) requires that when Water Service has reason to believe that the water it is supplying fails, or is likely to fail, to meet the standards of wholesomeness specified in regulation 4 and Schedule 1, it shall investigate the cause of that failure, or likely failure. Similarly, Regulation 17(3) requires Water Service to investigate the cause of any failure, or likely failure, to meet the concentration or value specified in an authorisation.
- 3 Regulation 18(1) requires that when Water Service has reason to believe that the water it is supplying fails, or is likely to fail, to meet the specifications for indicator parameters set out in Schedule 2, it shall investigate the cause of that failure, or likely failure.

Initiation of Formal Notice Action

- 4 The Inspectorate is informed about contraventions of the drinking water quality standards, as they arise, through the exceedence reports submitted by Water Service, under the reporting procedures required by the Inspectorate, contained in Appendix 2. These procedures present a requirement, whereby, it is incumbent upon Water Service to provide adequate comments within the exceedence investigation reports, including full details of actions taken to prevent a recurrence of any contraventions, if it is to avoid initiation of formal notice action for non-trivial contraventions of the standards.

- 5 In all cases where the Inspectorate is satisfied that a contravention is not trivial, and Water Service has not taken, or initiated, adequate action to prevent a recurrence, it will send Water Service a standard letter indicating that “consideration is being given to the making of a formal notice.” This letter, which means that formal notice action is initiated, will invite Water Service to:
- 5.1 **For Non-Trivial Contraventions of Regulation 17 (Schedule 1 Parameters)**
- (i) within two weeks of the date of the letter, provide the Inspectorate with any further evidence and assurance that it has taken steps to prevent a recurrence of the contravention; or if not
 - (ii) within four weeks of the date of the letter, submit an application for an Authorised Departure, as specified in regulation 20 of the Regulations, together with a draft of the proposed application.
- 5.2 **For Recurring Contraventions of Regulation 18 (Schedule 2 Parameters)**
- (i) within two weeks of the date of the letter, provide the Inspectorate with any further evidence and assurance that it has taken steps to prevent a recurrence of the contravention; or
 - (ii) where the contravention poses a risk to health, the Inspectorate will require Water Service to take specified steps as detailed in a notice.
- 6 The letter will have attached a model pro-forma application form, a copy of which is enclosed as Appendix 8. Electronic copies of this letter will also be sent by e-mail. Water Service should submit applications and draft Authorised Departures by e-mail to DWI@doeni.gov.uk, in which case, hard copies are not needed.
- 7 The Inspectorate will assess Water Service’s response to 5.1(i) and 5.2(i) above, within two weeks, and, if it is not satisfied with the response, will by letter (sent in hard copy and by e-mail) request Water Service to:
- (i) either submit an application and a draft Authorised Departure within two weeks of the date of that letter. The Inspectorate may start the process of preparing a notice of intention to make a formal notice against Water Service if it has not submitted an application and draft Authorised Departure within the period given in 5.1(ii), or in this paragraph, whichever is appropriate; or
 - (ii) implement the steps considered necessary by the Inspectorate as specified in the formal notice.

- 8 The Inspectorate will assess the application and the draft Authorised Departure within four weeks of receipt from Water Service. There will probably be some dialogue between the Inspectorate and Water Service during this period, to ensure that the final Authorised Departure will meet the requirements of regulation 4 and that the Inspectorate is likely to be satisfied in accordance with regulation 5. The Inspectorate will then by letter (sent in hard copy and by e-mail) request Water Service to submit a signed Authorised Departure in hard copy, taking into account any changes that may be indicated, within four weeks of the date of that letter. In addition, a copy of the Authorised Departure **must** also be provided by e-mail or on a disk.
- 9 If Water Service, having detected a contravention of a standard, considers that the contravention cannot be remedied quickly and is unlikely to be regarded as trivial by the Inspectorate, it may make an application for an Authorised Departure and submit a draft Authorised Departure without waiting for the Inspectorate's standard letter indicating that "consideration is being given to the making of a formal notice" to issue. The procedure laid out in paragraph 5.1(ii) would apply.

Acceptance of an Authorised Departure

- 10 If the Inspectorate is satisfied with the items specified in regulation 5, it will send Water Service a letter in accordance with regulation 21, accepting the Authorised Departure. This letter will be sent to Water Service in hard copy and by e-mail.

Review of an Authorised Departure

- 11 In accordance with the terms and conditions presented in Regulation 21, the Inspectorate will monitor, by a process of 'Quarterly Review', the progress of work necessary to comply with the Authorised Departure requirements.

Enquiries

- 12 Any enquiries about this letter should be addressed to Randal Scott (028 9054 6497) or Margaret Herron (028 9054 6708).
- 13 Copies of this letter are being sent to Director of Environmental Protection (Environment and Heritage Service); Directors of Public Health; Consultants for Communicable Disease; Chief Environmental Health Officer (DHSSPS); Chief Environmental Health Officers, district councils; Communicable Disease Surveillance Centre (Northern Ireland); and Environmental Policy Division (DoE).
- 14 Please acknowledge receipt of this letter, by e-mail to DWI@doeni.gov.uk

Our Ref: DWI 97/03

Date: 29 January 2004

To: Water Service Board Level Contact, Standards and Regulation Directorate

Guidance on the Information to be Provided in Initial and Final Reports on Water Quality Events and Other Matters – Regulation 34 (8 and 9) of the Water Supply (Water Quality) Regulations (Northern Ireland) 2002

Purpose

- 1 The purpose of this letter is to provide Water Service with guidance on compliance with the provision of information requirements associated with regulation 34(8 and 9) of the 2002 Regulations. Water Service is required to provide this information to the Drinking Water Inspectorate.

This guidance supersedes all previous information requirements which were issued in association with the Water Quality Regulations (Northern Ireland) 1994.

Regulation 34 (8 and 9)

Provision of Information - Events, Incidents, Emergencies, etc

Definitions:

‘Relevant Authority’ – means the Department of the Environment (in effect, the Drinking Water Inspectorate for Northern Ireland)

‘the 2002 Regulations’ – means the Water Supply (Water Quality) Regulations (Northern Ireland) 2002

- 2 Water Service shall **notify** the relevant authority of:
 - (a) the occurrence of any event which, by reason of its effect or likely effect on the quality or sufficiency of water supplied by it, gives rise or is likely to give rise to a significant risk to the health of persons to whom the water is supplied. This will include any event notified by Water Service to appropriate district councils or to a health and social services board, under the provision of regulation 34 of the 2002 Regulations.
 - (b) any other matters relating to the supply of water which:

- (i) in the **opinion** of Water Service, is of national significance; or
 - (ii) has attracted, or in the **opinion** of Water Service, is likely to attract significant or national publicity; or
 - (iii) has caused, or in the **opinion** of Water Service, is likely to cause significant concern to persons to whom water is supplied.
- (c) any reports of disease in the community which appear might possibly be associated with a water supply.

3 The notification required by this paragraph shall be given:

- (a) as soon as maybe after the event or matter has come to Water Service's attention, by telephone or other appropriate means to the Drinking Water Inspectorate; and
- (b) no later than **three working days** after compliance with sub-paragraph (a), in writing (including fax, or electronic mail to: dwi@doeni.gov.uk) addressed to the Drinking Water Inspectorate.

4 The notification in writing shall include:

- a. particulars of the event or matter;
- b. an assessment of the effect or likely effect on the quality or sufficiency of water supplied by Water Service;
- c. an estimate of the population affected and whether particular sensitive water users such as hospitals, schools, food manufacturers, etc are affected;
- d. such information as may be available as the cause or likely cause of the event or matter;
- e. particulars of the action taken or proposed to be taken in relation to the event or matter to inform and protect consumers and to rectify the situation, and an estimate of when supplies are likely to be back to normal; and
- f. a list of persons (other than consumers of Water Service) notified of the event or matter, and a copy of any notices issued to consumers and to the press as respects the event or matter.

5 Within **20 working days** of the date of the notification in writing, or such longer period as may in any case be agreed with the Drinking Water

Inspectorate, Water Service shall submit a report relating to the event or matter and containing:

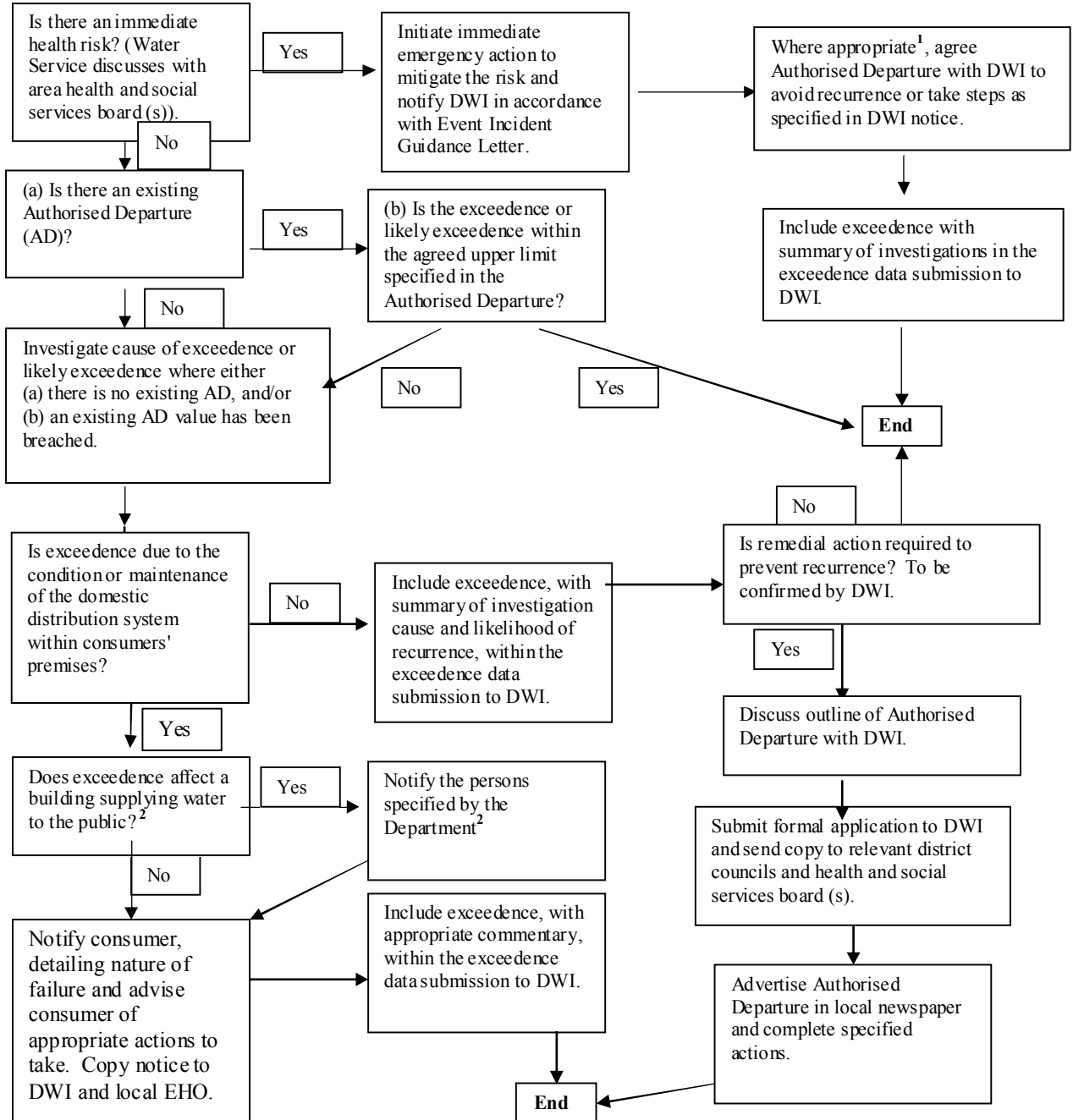
- a. such information as is necessary to supplement the information given in accordance with paragraph (2)(b);
- b. if samples were taken in connection with the event or matter, particulars of the time at which the samples were taken, the places from which the samples were taken and the results of the analysis of the samples;
- c. a copy of any report or advice provided to Water Service by its medical, scientific or technical advisers, any district council or any health and social services board;
- d. an assessment of the effectiveness of the action taken in respect of the event or matter and of the adequacy of the arrangements for liaison with any district council and health and social services board, Environment and Heritage Service's Water Management Unit (operations unit), the emergency services and the public, as the case may be;
- e. a statement of any lessons learned and of any proposals, if any, for further action identified by Water Service as being necessary or desirable in the light of the event or matter; and
- f. such other information relating to the event or matter which Water Service considers relevant.

Enquiries

- 6 Any enquiries about this letter should be addressed to Randal Scott (028 9054 6497) or Margaret Herron (028 9054 6708)
- 7 Copies of this letter are being sent to the Director of Environmental Protection (Environment and Heritage Service); Directors of Public Health; Consultants for Communicable Disease; the Chief Environmental Health Officer (DHSSPS); Chief Environmental Health Officers, district councils; Communicable Disease Surveillance Centre (Northern Ireland); and Environmental Policy Division (DoE).

APPENDIX 5

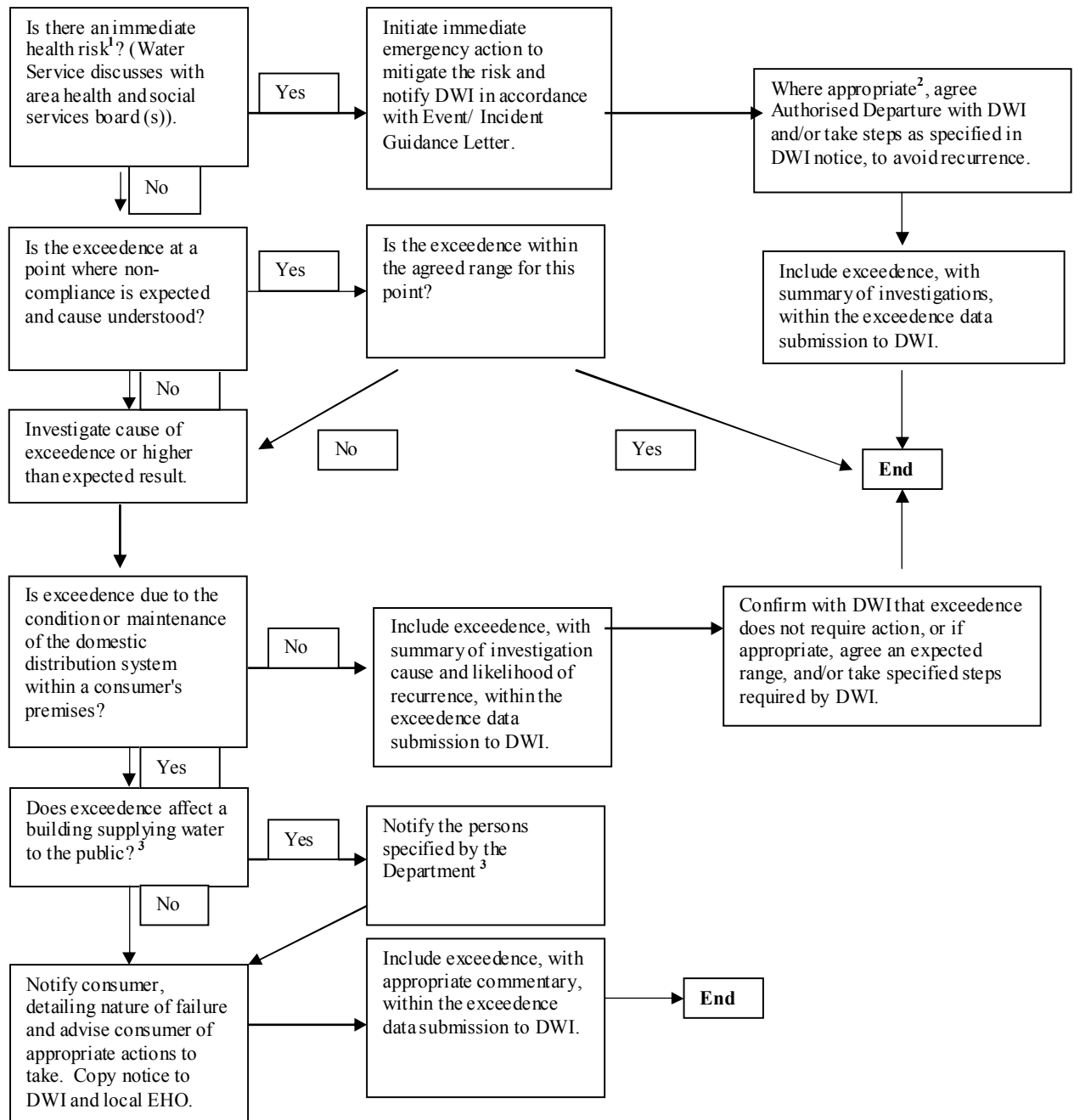
PROCEDURE TO BE FOLLOWED IF SCHEDULE 1 (MANDATORY) PARAMETER FAILS OR IS LIKELY TO FAIL A PRESCRIBED CONCENTRATION OR VALUE



¹ This is only likely to be considered in exceptional circumstances.

² Details to be confirmed when Regulations on the quality of water supplied to public buildings are in place.

PROCEDURE TO BE FOLLOWED IF SCHEDULE 2 (INDICATOR) PARAMETER DOES NOT MEET A SPECIFICATION

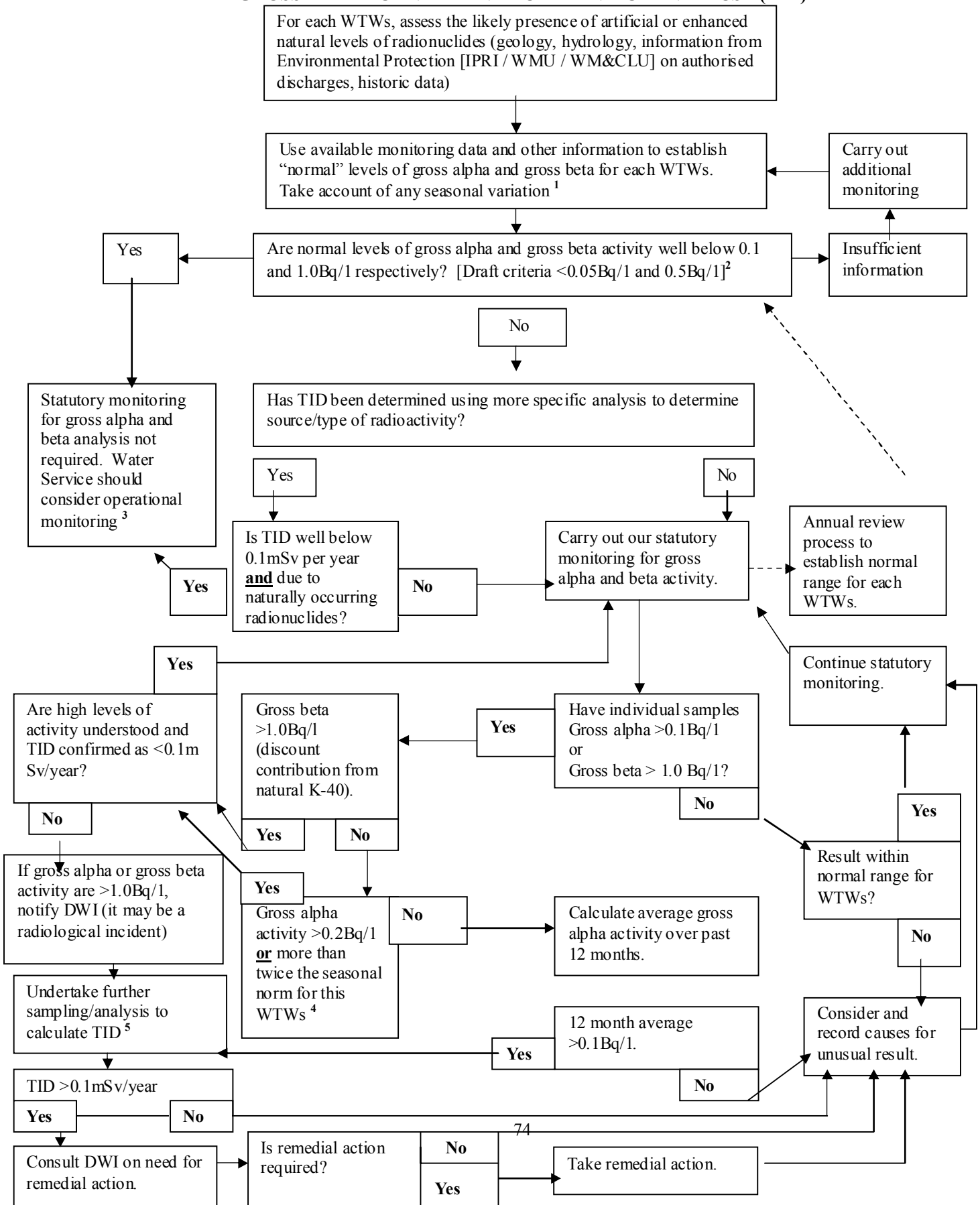


¹ An immediate health risk for an indicator parameter is unlikely but possible (e.g. very high levels of radioactivity).

² This is only likely to be considered in exceptional circumstances.

³ Details to be confirmed when Regulations on the quality of water supplied to public buildings are in place.

RADIOACTIVITY FLOW CHART FOR MONITORING OF GROSS ALPHA AND GROSS BETA ACTIVITY AND TOTAL INDICATIVE DOSE (TID)



**RADIOACTIVITY FLOW CHART FOR MONITORING OF GROSS ALPHA AND
GROSS BETA ACTIVITY AND TOTAL INDICATIVE DOSE (TID)**

Footnotes for the Flow Chart

- ¹ Seasonal increases in river flow may dilute any inputs of artificial radionuclides or those associated with water reuse (e.g. potassium-40) but flood conditions may encourage an increase in soil run-off and increase the input of some naturally occurring radionuclides.
- ² Excluding tritium, potassium-40, radon and radon decay products.
- ³ Radioactivity is now a feature of the drinking water regulations. Therefore, it is prudent for Water Service to carry out an operational monitoring programme to demonstrate that there have been no significant changes over time.
- ⁴ The use of 0.2Bq/l is a tentative proposal in recognition of the fact that the World Health Organization is likely to increase its screening value for gross alpha (possibly to 0.5Bq/l). Using 0.2Bq/l will minimize the need for more detailed analysis on those supplies that show seasonal variations that take occasional samples just above 0.1Bq/l.
- ⁵ Further analysis should not necessarily involve comprehensive analysis for all radionuclides. In the first instance, the presence of naturally occurring radionuclides such as uranium-238, or radium-226 should be considered. If these substances account for the vast majority of the recorded activity (i.e. the unaccounted for activity is <0.05Bq/l or 0.5Bq/l), then the Total Indicative Dose calculation should be based on these substances alone. It should be noted that ICP-MS methods can be used to give an initial and rapid indication as to what substances might be contributing to the elevated levels of radioactivity.

Note A - General reasons why PCV is not achievable

Note B – Map, water supply zone (WSZ) name, reference code, designated population served, average daily quantity of water supplied to the WSZ.

Resident population estimates – census information, local authority updates, recorded number of connections and estimates of average occupancy can all be used to make an estimate of WSZ population.

Note C – Describe briefly the investigations carried out. Include sampling evidence (date and place at which each sample was taken and the results of analysis of the samples in respect of each parameter taken in the water supply zone during the 12 months immediately preceding the first day on which the prescribed concentration or value (PCV) could not be met. Include the results of the analysis of the samples (if any) taken in the water supply zone between the first day on which the PCV could not be met and the date of the application.

Include other relevant evidence or information including the investigations to identify the options to remedy the contravention and the reasons for rejecting or preferring each option. Explain why the steps in the preferred option will remedy the contravention.

Estimates of the maximum deviation likely to occur while steps are being taken and an explanation of the basis of that estimate should be provided.

Note D – Water Service to liaise with Environmental Health Officer who has responsibility for the area served by the WSZ. Where there is considered to be a special risk, provide details of advice as to the measures (if any) given.

Note E – Authorised departure period can be granted for a maximum of 3 years. In certain circumstances, where the Department considers that it is not possible to restore a wholesome water supply within the initial 3 years, WS may apply for a further departure period.

Note F – Provide details of alternative supplies and explain why those supplies cannot be used, or in the case of the one that has to be used, why it can be used, until compliance has been achieved.

Note G - Explanation of the measures proposed for the monitoring of the quality of water supplied, and the measures for preventing any danger to public health arising while remedial steps are being taken. Define monitoring scheme, e.g. based on increased sampling frequency schedules contained in the Water Quality Regulations (Northern Ireland) 1994.

Note H – **Programme timetable** for compliance improvement work, **estimated cost of work** and provisions for reviewing the progress of the work and reporting the result of the review to the Inspectorate. **Compliance steps to be taken** should include details on: process selection; planning permission; design; tendering; construction; commissioning; and beneficial use. Project completion date is inclusive of a one year commissioning period.

Note I – The name, address and date of the application and supporting information sent to the respective authorities (in accordance with Regulation 20(4)). The appropriate local and health authorities have 30 working days to make any representations on the application (beginning with the date on which the application for the authorisation is made).

Note J – Any other information which Water Service believes is relevant and would help the Inspectorate assess the application efficiently.

REPORT TO DISTRICT COUNCILS (REGULATION 34)

DISTRICT COUNCIL REPORT

Regulation	Information Required	Page 1 of 3				
34						
34(4)(a)	WATER TREATMENT WORKS					
34(5)	For each WTWs which supplies water to the DC area					
34(5)(a)	Names of water supply zones supplied from WTWs					
34(5)(b)	General requirement for provision of results					
34(5)(c)	Schedule 1 Parameters	No. of Samples	No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	T Coliforms					
	<i>E. Coli</i>					
	Nitrite					
34(5)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Colony Counts					
	Turbidity					
	Residual Chlorine (No. of samples - no Spec or PCV)					
34(5)(e)	Schedule 1 Parameters		Min	Mean	Max	
	Nitrite					
	<i>Cryptosporidium</i> (not TC/EC)					
34(5)(f)	Schedule 2, Indicator Parameters		Min	Mean	Max	
	Residual Chlorine (not <i>Clostridium Perfringens</i>)					
34(4)(b)	SERVICE RESERVOIRS					
34(6)	For each SR which supplies water to the DC area					
34(6)(a)	Names of water supply zones supplied from SRs					
34(6)(b)	General requirement for provision of results					
34(6)(c)	Schedule 1 Parameters	No. of Samples	No. of Samples >PCV	% >PVC	No. of Samples >AD	% >AD
	Total Coliforms					
	<i>E. Coli</i>					

Regulation	Information Required					
SERVICE RESERVOIRS (cntd)						
34(6)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Colony Counts					
	Residual Chlorine (No. of samples - no Spec or PCV)					
34(6)(e)	Schedule 1 Parameters (not Total Coliforms/ <i>E. Coli</i>)		Min	Mean	Max	
34(6)(e)	Schedule 2, Indicator Parameters Residual Chlorine (not <i>Clostridium Perfringens</i>)		Min	Mean	Max	
SUPPLY POINTS						
34(4)(b)	For each supply point which supplies water to the DC area					
34(6)	Names of water supply zones supplied from supply points					
34(6)(a)	Names of water supply zones supplied from supply points					
34(6)(c)	Schedule 1 Parameters	No. of Samples	No. of Samples >Specification	% >PCV	No. of Samples >AD	% >AD
	Benzene, etc					
34(6)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >PCV	% >Specification		
	Chloride, etc					
34(6)(e)	Schedule 1 Parameters Benzene, etc		Min	Mean	Max	
34(6)(e)	Schedule 2, Indicator Parameters Chloride, etc		Min	Mean	Max	
WATER SUPPLY ZONES						
34(7)	For each water supply zone which supplies water to the DC area					
34(7)(a)	The number of samples taken for each parameter					
34(7)(b)	General requirement for provision of results					
34(7)(c)	Schedule 1 Parameters		No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	Enterococci					
	<i>E. Coli</i>					
	Aluminium, etc					
	Antimony, etc					

Regulation	Information Required					
WATER SUPPLY ZONES (cntd)						
34(7)(d)	Schedule 2, Indicator Parameters		No. of Samples >Specification	% >Specification		
	Colony Counts					
	Residual Chlorine (No. of samples - no Spec or PCV)					
	Ammonium, etc					
34(7)(e)	Schedule 1 Parameters		Min	Mean	Max	
	Aluminium, etc					
	Antimony, etc					
	(not Enterococci/ <i>E. Coli</i>)					
34(7)(f)	Schedule 2, Indicator Parameters		Min	Mean	Max	
	Residual Chlorine					
	Ammonium, etc					
	(not Total Coliforms/ <i>Clostridium Perfringens</i>)					

ANNUAL* WATER QUALITY REPORT (REGULATION 35)

WATER SERVICE ANNUAL* WATER QUALITY REPORT

Regulation	Information Required					
35						
	WATER TREATMENT WORKS					
35(1)(a)	No. of WTWs, SRs and supply points					
35(1)(b)	No. of water supply zones					
35(1)(c)	For all WTWs information in 35(4) (aggregated data)					
35(4)(a)	Total no. of samples (each parameter, Chlorine Residual, <i>Cryptosporidium</i>)					
35(4)(b)	Schedule 1	No. of Samples	No. of Samples > PCV	% >PCV	No. Samples >AD	% >AD
	Total Coliforms					
	<i>E. Coli</i>					
	Nitrite					
35(4)(c)	No. and % of WTWs in which samples >PCV					
	No. and % of WTWs in which samples >AD					
35(4)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Colony Counts					
	Turbidity					
	<i>Cryptosporidium</i>					
35(4)(e)	No. and % of WTWs in which samples >Specification					
	SERVICE RESERVOIRS					
35(1)(d)	For all SRs (and supply points) information in 35(5) (aggregated data)					
35(5)(a)	Total no. of samples (each parameter, Chlorine Residual)					
35(5)(b)	Schedule 1	No. of Samples	No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	Total Coliforms					
	<i>E. Coli</i>					
35(5)(c)	No. and % of SRs in which samples >PCV					
	No. and % of SRs in which samples >AD					

Regulation	Information Required					
SERVICE RESERVOIRS (cntd)						
35(5)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Colony Counts					
35(5)(e)	No. and % of SRs in which samples >Specification					
SUPPLY POINTS						
35(1)(a)	No of supply points					
35(1)(d)	For all supply points information in 35(4) and 35(5) (aggregated data)					
35(5)(a)	Total no. of samples (each parameter, Chlorine Residual)					
35(5)(b)	Schedule 1	No. of Samples	No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	Benzene, etc					
35(5)(c)	No. and % of supply points in which samples >PCV					
	No. and % of supply points in which samples >AD					
35(5)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Chloride, etc					
35(5)(e)	No. and % of supply points in which samples >Specification					
WATER SUPPLY ZONES						
35(1)(e)	For all water supply zones information in 35(6) (aggregated data)					
35(6)(a)	The number of samples taken for each parameter					
35(6)(b)	Schedule 1	No. of Samples	No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	Enterococci					
	<i>E. Coli</i>					
35(6)(b)	Schedule 1 (cntd)	No. of Samples	No. of Samples >PCV	% >PCV	No. of Samples >AD	% >AD
	Aluminium, etc					
	Antimony, etc					

Regulation	Information Required					
WATER SUPPLY ZONES (cntd)						
35(6)(c)	No. and % of zones in which samples >PCV					
	No. and % of zones in which samples >AD					
35(6)(d)	Schedule 2, Indicator Parameters	No. of Samples	No. of Samples >Specification	% >Specification		
	Colony Counts					
	Ammonium, etc					
35(6)(e)	No. and % of zones in which samples >Specification					

**This annual reporting format should be used to submit cumulative monthly compliance data submissions to DWI.*

SUMMARY OF MONITORING REQUIREMENTS

Parameter	Unit	PCV (Specification for Indicator Parameters)	Point of Monitoring	Check (High) Monitoring	Audit (Low) Monitoring	Annual Sampling Frequency - Water Supply Zones			Annual Sampling Frequency - Water Treatment Works or Supply Points		
						Population	Reduced Frequency Range	Standard Frequency Range	Volume m ³ /d	Reduced Frequency Range	Standard Frequency Range
TABLE A: Microbiological Parameters - Directive Requirements											
Enterococci	No/100ml	0	T	X	Yes	Pop B	X	1-8	X	X	X
<i>Escherichia Coli</i>	No/100ml	0	T	Yes	X	<100	X	4	X	X	X
						>100	X	12 per each 5,000	X	X	X
TABLE A: Microbiological Parameters - National Requirements											
Coliform Bacteria	No/100ml	0	T + SR + WTW	Yes	X	<100	X	4	Vol C	12-104 ⁽¹⁾	4-365
						>100	X	12 per each 5,000			
<i>Escherichia Coli</i>	No/100ml	0	SR + WTW	Yes	X	X	X	X	Vol C	12-104 ⁽¹⁾	4-365
Residual Disinfectant	mg/l	X	T + SR + WTW + SP	X	Yes	<100	X	4	Vol C	12-104 ⁽¹⁾	4-365
						>100	X	12 per each 5,000			

SUMMARY OF MONITORING REQUIREMENTS

TABLE B: Chemical Parameters - Directive Requirements

Parameter	Unit	PCV (Specification for Indicator Parameters)	Point of Monitoring	Check (High) Monitoring	Audit (Low) Monitoring	Annual Sampling Frequency - Water Supply Zones			Annual Sampling Frequency - Water Treatment Works or Supply Points		
						Population	Reduced Frequency Range	Standard Frequency Range	Volume m ³ /d	Reduced Frequency Range	Standard Frequency Range
Acrylamide	µg/l	0.1	PS	X	X	X	X	X	X	X	X
Antimony	µg Sb/l	5	T (or SP) ⁽²⁾	X	Yes	Pop B	X	1-8	Vol E ⁽²⁾	X	1-48
Arsenic	µg As/l	10	T (or SP) ⁽²⁾	X	Yes	Pop B	X	1-8	Vol E ⁽²⁾	X	1-48
Benzene	µg/l	1	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Benzo (a) pyrene	µg/l	0.01	T	X	Yes	Pop B	X	1-8	X	X	X
Boron	mg B/l	1	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Bromate ⁽³⁾⁽⁴⁾	µg BrO ₃ /l	10	T or SP	X	Yes ⁽³⁾	Pop B ⁽³⁾	X	1-8	Vol E ⁽²⁾⁽⁴⁾	X	1-48
Cadmium	µg Cd/l	5	T (or SP) ⁽²⁾	X	Yes	Pop B	X	1-8	Vol E ⁽²⁾	X	1-48
Chromium	µg Cr/l	50	T	X	Yes	Pop B	X	1-8	X	X	X
Copper	mg Cu/l	2	T	X	Yes	Pop B	X	1-8	X	X	X
Cyanide	µg CN/l	50	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
1,2 Dichloroethane	µg/l	3	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Epichlorohydrin	µg/l	0.1	PS	X	X	X	X	X	X	X	X
Fluoride	mg F/l	1.5	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Lead ⁽⁵⁾	µg Pb/l	25	T	X	Yes	Pop B	X	1-8	X	X	X
Lead ⁽⁶⁾	µg Pb/l	10	T	X	Yes	Pop B	X	1-8	X	X	X
Mercury	µg Hg/l	1	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Nickel	µg Ni/l	20	T	X	Yes	Pop B	X	1-8	X	X	X
Nitrate ⁽⁷⁾	mg NO ₃ /l	50	T (or SP) ⁽²⁾	Yes ⁽⁷⁾	Yes	Check ⁽⁷⁾	1-38	2-76	X	X	X
						Pop A					
						Audit	X	1-8	X	X	X
						Pop B					

SUMMARY OF MONITORING REQUIREMENTS

TABLE B: Chemical Parameters - Directive Requirements (cntd)

Parameter	Unit	PCV (Specification for Indicator Parameters)	Point of Monitoring	Check (High) Monitoring	Audit (Low) Monitoring	Annual Sampling Frequency - Water Supply Zones			Annual Sampling Frequency - Water Treatment Works or Supply Points		
						Population	Reduced Frequency Range	Standard Frequency Range	Volume m ³ /d	Reduced Frequency Range	Standard Frequency Range
Nitrite ⁽⁸⁾	mg N0 ₂ /l	0.5	T	Yes ⁽⁸⁾	Yes	Check Pop A	1-38	2-76	X	X	X
						Audit Pop B	X	1-8	X	X	X
Nitrite ⁽⁸⁾	mg N0 ₂ /l	0.1	WTW	Yes ⁽⁸⁾	Yes	X	X	X	Check Vol C ⁽⁸⁾	12-104 ⁽¹⁾	4-365
									Audit Vol E	X	1-48
Aldrin	µg/l	0.03	T or SP	X	Yes	Pop B ^(1,2)	X	1-8	Vol E ^(1,2)	X	1-48
Dieldrin	µg/l	0.03	T or SP	X	Yes	Pop B ^(1,2)	X	1-8	Vol E ^(1,2)	X	1-48
Heptachlor	µg/l	0.03	T or SP	X	Yes	Pop B ^(1,2)	X	1-8	Vol E ^(1,2)	X	1-48
Heptachlor Epoxide	µg/l	0.03	T or SP	X	Yes	Pop B ^(1,2)	X	1-8	Vol E ^(1,2)	X	1-48
Other Individual Pesticides	µg/l	0.1	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Total Pesticides	µg/l	0.5	T or SP	X	Yes	Pop B	X	1-8	Vol E ^(1,2)	X	1-48
PAH	µg/l	0.1	T	X	Yes	Pop B	X	1-8	X	X	X
Selenium	µg/l Se/l	10	T (or SP) ⁽²⁾	X	Yes	Pop B	X	1-8	Vol E ⁽²⁾	X	1-48
Tetrachloroethane	} µg/l	} 10	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Trichloroethane											
Trihalomethanes	µg/l	100	T (or SP) ⁽²⁾	X	Yes	Pop B	X	1-8	Vol E ⁽²⁾	X	1-48
Vinyl Chloride	µg/l	0.5	PS	X	X	X	X	X	X	X	X

SUMMARY OF MONITORING REQUIREMENTS

TABLE B: Chemical Parameters - National Requirements

Parameter	Unit	PCV (Specification for Indicator Parameters)	Point of Monitoring	Check (High) Monitoring	Audit (Low) Monitoring	Annual Sampling Frequency - Water Supply Zones			Annual Sampling Frequency - Water Treatment Works or Supply Points		
						Population	Reduced Frequency Range	Standard Frequency Range	Volume m ³ /d	Reduced Frequency Range	Standard Frequency Range
Aluminium ⁽¹⁰⁾	µg Al/l	200	T	Yes ⁽¹⁰⁾	Yes	Check ⁽¹⁰⁾ Pop A	1-38	2-76	X	X	X
						Audit Pop B	X	1-8	X	X	X
Colour	mg/l Pt/Co	20	T	Yes	X	Pop A	1-38	2-76	X	X	X
Hydrogen Ion	pH value	6.5-10	T	Yes	X	Pop A	1-38	2-76	X	X	X
Iron ⁽¹⁰⁾	µg Fe/l	200	T	Yes ⁽¹⁰⁾	Yes	Check ⁽¹⁰⁾ Pop A	1-38	2-76	X	X	X
						Audit Pop B	X	1-8	X	X	X
Manganese ⁽¹¹⁾	µg Mn/l	50	T	Yes ⁽¹¹⁾	Yes	Check ⁽¹¹⁾ Pop A	1-38	2-76	X	X	X
						Audit Pop B	X	1-8	X	X	X
Odour	Dilution Number	3	T	Yes	X	Pop A	1-38	2-76	X	X	X
Sodium	µg Na/l	200	T	X	Yes	Pop B	X	1-8	X	X	X
Taste	Dilution Number	3	T	Yes	X	Pop A	1-38	2-76	X	X	X
Tetrachloromethane	µg/l	3	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Turbidity	NTU	4	T	Yes	X	Pop A	1-38	2-76	X	X	X

SUMMARY OF MONITORING REQUIREMENTS

SCHEDULE 2 - Indicator Parameters

Parameter	Unit	PCV (Specification for Indicator Parameters)	Point of Monitoring	Check (High) Monitoring	Audit (Low) Monitoring	Annual Sampling Frequency - Water Supply Zones			Annual Sampling Frequency - Water Treatment Works or Supply Points		
						Population	Reduced Frequency Range	Standard Frequency Range	Volume m ³ /d	Reduced Frequency Range	Standard Frequency Range
Ammonium	mg NH ₄ /l	0.5	T	Yes	X	Pop A	1-38	2-76	X	X	X
Chloride	mg Cl/l	250	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
<i>Clostridium Perfringens</i> ⁽⁹⁾	No/100ml	0	T + WTW ⁽⁹⁾	Yes ⁽⁹⁾	Yes	Check Pop A	1-38	2-76	Check Vol D ⁽⁹⁾	2-1095 ⁽¹⁾	2-2190
						Audit Pop B	X	1-8	Audit Vol E	X	1-48
Colony Counts	No/1ml @ 22°C No/1ml @ 37°C	NAC	T + SR + WTW	Yes	X	Pop A	1-38	2-76	Vol C	12-104 ⁽¹⁾	4-365
Conductivity	µS/cm @ 20°C	2500	T or SP	Yes	X	Pop A	1-38	2-76	Vol E	X	1-48
Sulphate	µg SO ₄ /l	250	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Total Indicative Dose ⁽¹³⁾	mSv/year	0.1	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Total Organic Carbon	mg C/l	NAC	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Tritium ⁽¹³⁾	Bq/l	100	T or SP	X	Yes	Pop B	X	1-8	Vol E	X	1-48
Turbidity	NTU	1	WTW	X	X	X	X	X	Vol C	12-104 ⁽¹⁾	4-365
Others											
Nitrate/Nitrite Formula	mg/l	NO ₃ /50 + NO ₂ /3 =<1	T	X	Yes	Calculate from above Sample Results	X	X	X	X	X

SUMMARY OF MONITORING REQUIREMENTS

NOTES

X = Not Applicable; **NAC** = No Abnormal Change; **PS** = Product Specification; **SP** = Supply Point; **SR** = Service Reservoir; **T** = Consumers' taps in WSZs; **WTW** = Water Treatment Works; and **WSZ** = Water Supply Zone

⁽¹⁾ Reduced frequency not available if <20m³/d water supplied.

⁽²⁾ Supply point monitoring only if authorised by the Secretary of State under regulation 8.

⁽³⁾ Audit monitoring in WSZ is required only where sodium hypochlorite is added after water has left the WTW.

⁽⁴⁾ Audit monitoring at SP is required only when sodium hypochlorite is not added after water has left the WTW.

⁽⁵⁾ Prescribed concentration applies from 25 December 2003 until 24 December 2013.

⁽⁶⁾ Prescribed concentration applies on after 25 December 2013.

⁽⁷⁾ Check monitoring in WSZ is required only when chloramination is practised.

⁽⁸⁾ Check monitoring is required only when chloramination is practised.

⁽⁹⁾ Check monitoring is required only in respect of surface waters (see regulation 6(2) and Table 1 of Schedule 3).

⁽¹⁰⁾ Check monitoring is required when used as a flocculant or where the water originates from, or is influenced by, surface waters.

⁽¹¹⁾ Check monitoring is required where the water originates from, or is influenced by, surface waters.

⁽¹²⁾ If required by pesticide monitoring strategy.

⁽¹³⁾ If required by radioactivity monitoring strategy.

SUMMARY OF MONITORING REQUIREMENTS

SAMPLING FREQUENCIES

Population A (Check) Zones	<100	100 - 4,999	5,000 - 9,999	10,000 - 29,999	30,000 - 49,999	50,000 - 79,999	80,000 - 100,000			
Reduced Frequency	1	2	6	12	18	26	38			
Standard Frequency	2	4	12	24	36	52	76			
Population B (Audit) Zones	<100	100 - 4,999	5,000 - 100,000							
Reduced Frequency	N/A	N/A	N/A							
Standard Frequency	1	4	8							
Volume C (Check) WTW (m³/day)	<20	20 - 1,999	2,000 - 5,999	6,000 - 11,999	>12,000					
Reduced Frequency	N/A	12	52	104	104					
Standard Frequency	4	52	104	208	365					
Volume D (Check) Supply Points (m³/day)	<20	20 - 999	1,000 - 1,999	2,000 - 5,999	6,000 - 9,999	10,000 - 15,999	16,000 - 32,999	33,000 - 49,999	50,000 - 67,999	68,000 - 84,999
Reduced Frequency	N/A	2	6	12	18	26	52	78	104	130
Standard Frequency	2	4	12	24	36	52	104	156	208	260
Vol D (cont'd)	85,000 - 101,999	102,000 - 119,999	120,000 - 241,999	242,000 - 484,999	485,000 - 728,999					
Reduced Frequency	156	183	365	730	1,095					
Standard Frequency	312	365	730	1,460	2,190					
Volume E (Audit) Supply Points (m³/day)	<20	20 - 999	1,000 - 49,999	50,000 - 89,999	90,000 - 299,999	300,000 - 649,999	>650,000			
Reduced Frequency	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Standard Frequency	1	4	8	12	24	36	48			
Sampling Frequency for all Service Reservoirs - one sample for each week in which the reservoir is in use.										