
WATER INDUSTRY SPECIFICATION

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UK Water Industry

SPECIFICATION FOR THE AUDIT OF WATER INDUSTRY RISK ASSESSMENTS AND RISK MANAGEMENT PROCESSES

FOREWORD

Adoption of a risk assessment and risk management approach will contribute to water suppliers meeting their requirements to consistently ensure the wholesomeness and acceptability of drinking water supplies. Drinking water suppliers are obliged to use BS EN 15975-2:2013 (Security of drinking water supply - Guidelines for risk and crisis management, Part 2: Risk management) as their specification for the assessment and management of risks associated with the security of drinking water supplies.

The approach described within BS EN 15975-2:2013 is consistent with the Water Safety Plan (WSP) approach advocated by the World Health Organisation (WHO Water Safety Plan manual (WSP manual): Step-by-step risk management for drinking-water suppliers). It also aligns with the requirements of the current Water Supply (Water Quality) Regulations 2016 (and equivalent regulations in Wales).

Note that BS EN 15975-2:2013 consists of two parts. This specification relates exclusively to Part 2: Risk management. Part 1: Crisis management is outside the scope of this specification.

This specification has been prepared by the Water UK Task and Finish Group for Risk Assessment Certification under the direction of the Water UK Standards Board and it addresses the following objectives:

- It recognises the use of BS EN 15975-2:2013 and aligns risk assessment and risk management requirements with that standard to provide compatibility;
- It provides additional detail regarding current UK practice in relation to WSP activities;

- It provides a framework upon which inspections of WSP activities can be implemented;
- It provides a robust approach to ensure that all water company risk assessments carried out against Regulation 9 and Regulation 27 of the Regulations can be used as a basis to justify a risk based approach to sampling frequency. The regulatory reporting requirements for WSP are included in Regulation 28 (Regulations 28 and 29 respectively in Wales) of the Regulations.

The references provided were current at the time of writing this Water Industry Specification.

Compliance with this specification does not itself confer immunity from legal obligations.

This specification does not purport to include all the necessary provisions of a contract. Users of this specification are responsible for its correct application. Reference to a British Standard, Water Industry Specification or any other specification applies equally to any equivalent specification. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

An inspection process to ensure compliance with this specification will be performed by a UKAS accredited certification Inspection Body meeting the requirement of ISO/IEC 17020: 2012.

It has been assumed in the drafting of this specification that the execution of its provisions is entrusted to appropriately competent people.

Information contained in this specification is given in good faith but Water UK cannot accept any responsibility for actions taken by others as a result.

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1. SCOPE

This document specifies the principles of the risk assessment and risk management process that is undertaken by drinking water suppliers to ensure the integrity of the drinking water supply system. The risk assessment process is undertaken from source to consumers' taps and includes protection of sources (catchment), water abstraction, treatment, storage, distribution and up to the consumers' tap.

It is based on the British Standard EN 15975-2:2013 (hereafter referred to as the Standard), the principles of the holistic Water Safety Plans (WSP) approach of the World Health Organisation, the Drinking Water Inspectorate's water safety planning guidance (October 2005) and takes into account experience and evolution of Drinking Water Safety Plan (WSP) risk assessments since their introduction into the UK Water industry over 10 years ago.

The scope of the document is restricted to the WSP risk assessment process and governance thereof as required under the Regulations. Dynamic risk assessment processes e.g. discoloured water risk assessments for planned and unplanned work are out of scope of this document; they are considered as control measures (mitigation activities) within the WSP process.

2. TERMS AND DEFINITIONS

The terms and definitions used within the WSP process are listed in Table 1 as defined within the Standard, WHO Lexicon and DWI WSP guidance document. Additional definitions are included in the glossary at Appendix A.

3. OBJECTIVES AND STAKEHOLDERS' RESPONSIBILITY

Under the Regulations, drinking water suppliers are required to undertake a risk assessment of each treatment works and supply system where water is supplied for domestic purposes or food production purposes. The purpose of this is to establish whether there is a significant risk of supplying water from the works or the system that could constitute a potential danger to human health or is likely to be unwholesome (as defined by the Regulations).

The risk assessments shall:

- Follow the principles of the WHO WSP process and requirements of BSEN 15975-2:2013.
- Cover catchment, abstraction, treatment, storage, distribution and within building plumbing systems up to the consumer's tap.
- Include risks to be assessed for each hazard/hazardous event using a scoring system based on likelihood and consequence criteria
- Assess risk both before and after taking into consideration any control measures. The methodology shall be capable of identifying residual risks where further mitigation measures (additional control measures) are required.
- Be documented and the summary report be provided to the Drinking Water Inspectorate as detailed in the Water Suppliers' (Information Direction) 2017.
- Take into account any monitoring carried out under Article 7(i) and Article 8 of the Water Framework Directive.

Table 1: Terms and definitions extracted from the BS EN 15975-2:2013, WHO WSP Manual and the DWI WSP Guidance document.

Terms	BS EN 15975-2:2013	WHO WSP Manual Glossary	DWI WSP Guidance (WHO Lexicon)
Drinking water supply system integrity	Existence of drinking water supply system suitable to meet specified quality, quantity, continuity and pressure targets in accordance with legal/regulatory requirements and the drinking water supplier's objectives	n/a	n/a
Hazard	Biological, chemical, physical or radiological agent in, or condition of water, with the potential to cause harm to public health	A biological, chemical, physical or radiological agent in, or condition of water, with the potential to cause an adverse health effect. Another word for hazard includes "contaminant".	Physical, biological, chemical or radiological agents that can cause harm to public health (WHO/IWA 2009).
Hazardous event	Event that introduces hazards to, or fails to remove them from, the drinking water supply system	A process whereby a hazard/contaminant is introduced into a water supply.	An event that introduces hazards to, or fails to remove them from, the water supply
Corrective action	Action to eliminate the cause of a non-conformity (non-fulfilment of an operational target) and to prevent recurrence	Any action to be taken when the results of monitoring at the control point indicate a loss of control.	Any action to be taken when the results of monitoring at the control point indicate a loss of control
Risk control measure / Control measure	Risk control measure Any action and activity that can be used to prevent or eliminate a hazard or reduce it to an acceptable level	Control measure Any action and activity that can be used to prevent or eliminate a water safety hazard or reduce it to an acceptable level.	Control measure (water safety) Any action and activity that can be used to prevent or eliminate a water safety hazard or reduce it to an acceptable level (WHO/IWA 2009).
Risk / Risk score	Risk Combination of the likelihood of a hazardous event and the severity of consequences, if the hazard occurs in the drinking water supply system	Risk Score The score assigned to a hazard based on the risk analysis process.	Risk The likelihood of a hazard causing harm in exposed populations in a specified time frame, including the magnitude of that harm (WHO 2005). The probability of an adverse effect in an organism, system, or (sub) population caused under specified circumstances by exposure to an agent (WHO 2004).
Failure / deviation	Failure deviation from normal operating conditions characterised by its cause and the extent	Deviation Failure to meet a critical limit.	Deviation Failure to meet a critical limit (WHO/IWA 2009).
Validation	Obtain evidence, assessment and approval of the capability of the current or proposed control measures	Obtaining evidence that the elements of the WSP can effectively meet the water quality targets.	Obtaining evidence that the elements of the Water Safety Plan can effectively

Terms	BS EN 15975-2:2013	WHO WSP Manual Glossary	DWI WSP Guidance (WHO Lexicon)
			meet the water quality targets (WHO/IWA 2009).
Verification	Routine confirmation, through the provision of objective evidence, that the drinking water supply system is delivering water in accordance with the set objectives and that the risk management approach is effective	The application of methods, procedures, tests and other evaluations, to determine compliance with the WSP, i.e. checking whether the system is delivering water of the desired quality and whether the WSP is being implemented in practice.	The application of methods, procedures, tests and other evaluations, to determine compliance with the Water Safety Plan (WHO/IWA 2009).

- Consider risks to meeting defined water quality standards with regards to wholesomeness of water to consumers.
- Consider the multiple barrier approach and, where practicable, control measures shall be identified throughout all stages in the supply system to mitigate risk to water quality.
- Be kept under continuous review. The supplier shall have documented processes in place to incorporate new information, changes to risk scores and mechanisms for feeding into Company processes for agreeing and prioritising actions.

Due to the extent of the source to tap supply system, it may be necessary to involve third parties in the risk assessment process. Third parties should be encouraged to cooperate fully to ensure risks to the drinking water supply are adequately assessed with appropriate controls in place. The drinking water supplier is the responsible body for producing a WSP but other organisations, for example the Environment Agency or catchment landowners have significant roles in supplying data. Engagement with third parties shall be documented.

Other drivers may be incorporated into the risk assessment process, for example, pressure. These service objectives are checked and audited by other water industry processes.

4. RISK MANAGEMENT APPROACH

4.1 General

A WSP is a comprehensive risk assessment and risk management approach for all the steps in a water supply chain from catchment to consumer. The risk

assessment methodology and management approach shall be available and documented.

A WSP is essentially a framework of hazard and hazardous event identification, risk assessment, risk management including; the control measures, corrective actions/additional or enhanced control measures and verification with the associated documentation for each stage in the water supply chain. This approach comprises elements shown in Figure 1.

4.2 Interdisciplinary group for risk management approach

The responsibility for the preparation of a Company's WSP shall be held by a senior manager. All stages of the process require teamwork and the involvement of key stakeholders from relevant departments from within the Company and in some cases from third parties.

The multi-disciplinary team will vary depending on the supply system but can typically include:

- Operational Water Quality Scientists
- Public Health advisors
- Catchment Officers
- Operational Network staff
- Operational Production Staff
- Maintenance Engineers
- Design Engineers
- Asset Management

Although members of the WSP team are fundamental to the process of developing the plans, there may often only be a limited requirement for the physical assembling of the team. Team members shall be competent for their role. A Drinking Water Supplier's specific approach to the development of the interdisciplinary group, their respective roles and competence required shall be documented in their

methodology. Examples of Company structures can be found in Appendix B.

4.3 Drinking water supply system description

A 'Supply System' is defined as a group of assets that are connected from catchments through to Water Supply Zones to indicate the transfer of water from source to tap for a discrete area of the drinking water supplier's water network (Figure 2).

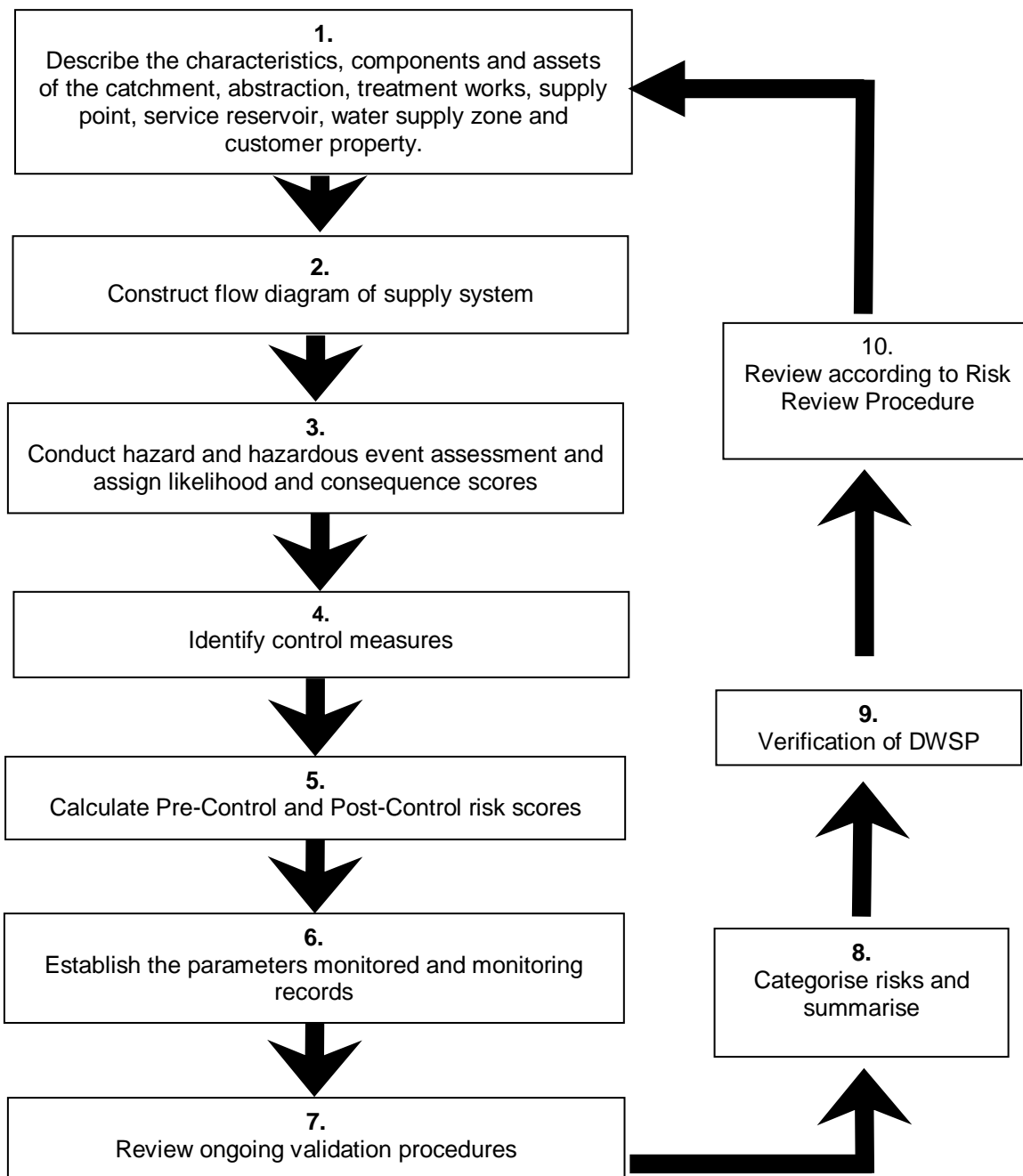


Figure 1: Overview of the process for producing a DWSP

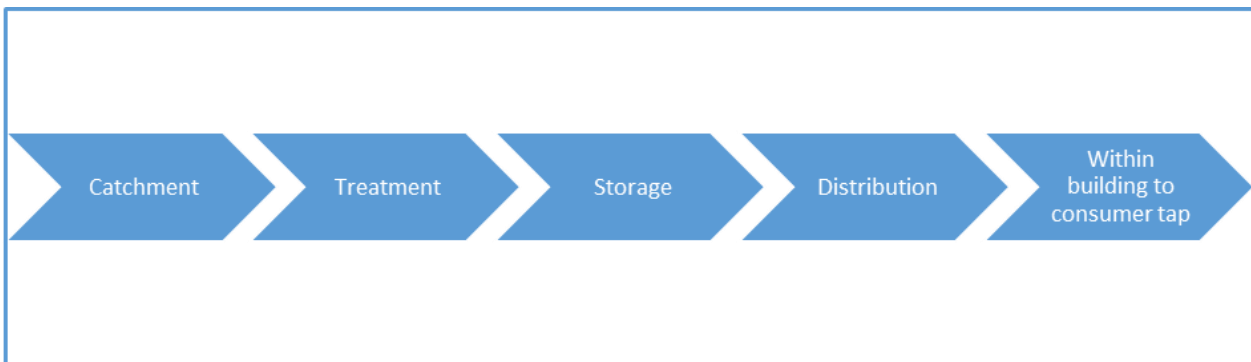


Figure 2: Supply System

An asset can appear in multiple supply systems which demonstrates the interconnectivity of the water network. The supply systems shall be uniquely identified and contain all assets that can form part of the supply system.

The assets referred to in the 'Supply System' shall be referenced according to the Information Direction 2017 'Details Table' which is submitted to the Drinking Water Inspectorate on at least an annual frequency. Supply system descriptions may include flow charts, geographic representation or tables.

For each drinking water supplier there are several different types of WSP risk assessment to cover the main stages of the Supply System. Additional assets to those included in Figure 2, may be required to fulfil the requirement from DWI that a risk assessment shall be produced for each asset, for example those companies with bulk supply inputs or concessionary supplies.

Any substantive change to a Supply System, for example the introduction of a new source or the rezoning of a water supply zone onto an alternative source shall require a review of the relevant Regulation 27 risk assessments and may require a resubmission of associated Regulation 28 reports.

4.4 Identification of hazards and hazardous events

Hazards can occur at various stages in the drinking water supply system. The purpose of this stage is to systematically identify from source through to consumer tap the potential hazards at each stage of the water supply system and how the hazard might enter or affect the quality of the water provided to the consumer.

The identification of hazards and hazardous events shall include each element of the water supply system (in Figure 2) where there are potential sources of contamination, potential for water to become unwholesome or where there could be a potential significant impact on the sufficiency of supply. The review shall identify whether the hazards identified present a risk in terms of likelihood and severity for that stage of the water supply system.

In order to apply for a waiver hazards must be reported individually. Typically a list of potential hazards might include those parameters monitored under the Regulations and should additionally include any specific supply system hazards identified through the risk assessment process or through previous experience or knowledge. The individual company approach shall be documented within their methodology.

4.5 Risk assessment

4.5.1 General

Water companies shall formally document their risk management and assessment approach by creating a Methodology document. As described earlier it shall be based on the WHO WSP planning approach and include a combination of the likelihood of a hazard occurring and separately the consequence of that hazard should it materialise.

The risk assessment methodology shall contain the company definitions of terms and ranges for likelihood and consequence. The risk assessment criteria shall be documented with sign off by responsible senior managers. Where there is a lack of data to make an assessment or there is uncertainty about the data or the risk context, the methodology should confirm and document the approach taken by the supplier.

4.5.2 Risk analysis

Risk analysis shall be carried out by the WSP group as described in (Figure 2). This shall be a systematic approach working through the hazards and/or hazardous events identified at each stage of the supply system.

Each hazard or hazardous event shall be assessed for likelihood of it occurring and the consequence of the resulting risk. This risk analysis shall score each risk individually to allow categorisation and prioritization for action.

Risk = Likelihood x Consequence

Different types of risk may require different risk analysis approaches. To ensure a consistent approach is taken the risk analysis criteria shall be clearly documented in the methodology including how the risk is calculated.

The likelihood of the hazard or hazardous event occurring could be described qualitatively in terms such as almost certain, likely, moderately likely, unlikely or rarely or by a quantitative scoring method such as probability or frequency over a given timeframe which shall be documented.

The consequences of the hazard, particularly the potential effect on human health, and meeting health based standards or indicator parameter values shall be assessed. Again this assessment could be described qualitatively in terms such as catastrophic, major, moderate, minor or insignificant or by a quantitative or semi-quantitative scoring method.

The risk shall then be determined by combining the likelihood and consequence according to the drinking water supplier methodology.

Examples of risk matrices are provided in the WHO WSP manual and the Standard with current examples from drinking water suppliers included in Appendix C.

4.5.3 Risk evaluation

The risk evaluation method shall analyse both the consequence and the likelihood twice; this will take into account the control and its effectiveness. In the first instance, risks shall be evaluated assuming that no control measures are in place; this is typically referred to as an "uncontrolled, pre-control or initial risk." The risk shall then be reassessed in terms of the effectiveness and suitability of the control measure. This assessment gives the "residual or post-control risk."

All risks across all water supply systems shall be compared, categorised and prioritised with regard to their likely impact on the delivery of safe and wholesome water to the consumers' taps and on human health. This process will help determine the risk exposure within the water supply system and allow for the prioritisation of control measures.

A mechanism shall be in place to review the resulting residual risks to inform priorities for where additional control measures, or enhancements to existing control measures are required. High priority risks are typically those that are deemed undesirable in terms of their potential impact on human health and/or wholesomeness. These risks often require improvements to be made to the system to achieve regulatory and/or health based targets. The improvement plan may include short, medium and/or long term measures. In addition, companies may consider having additional actions identified to improve robustness or resilience of existing control measures.

Lower priority risks will not necessarily require improvement action but shall be kept under review. The process of reassessing and prioritising risks shall take place post the validation of control measures. A consistent approach to reassessing and prioritising risks shall be maintained.

New risks that are identified which cannot be controlled effectively and could lead to risk to human health, should be considered under crisis management. This falls outside the scope of this document. These are subject to the requirements of BSEN 15975-1:2013 and are audited through separate processes.

4.6 Risk control

4.6.1 General

Risk control measures might be possible at each stage of the water supply system. Risk control measures in the catchment or at the point of abstraction; at the treatment works; in distribution or at treated water service reservoirs; and within consumers' premises can all facilitate the provision of safe and wholesome water to the consumers.

Control measures that are wholly within the drinking water supplier's control (such as treatment processes, or network control) shall be included for all risks that could potentially impact human health and/or wholesomeness. Risk control measures shall be documented, selected where appropriate and implemented where required.

The effectiveness of these control measures shall be validated against drinking water supplier and/or industry specifications or procedures.

4.6.2 Identification of risk control measures

Control measures shall be identified at each stage of the water supply system. The multi barrier approach is applicable in many source to tap supply systems to minimise the risk to water quality. A control measure applied at an 'upstream' stage might reduce, but not eliminate, the risk. The risk might be further mitigated or removed at a 'downstream' stage. For example, catchment management might reduce the risk of a pesticide being present in the raw water, while Granular Activated Carbon treatment might remove the pesticide such that the risk is eliminated. Risk control measures can be either preventative and/or reactive. Examples of control measures applicable to each stage of the risk assessment are provided in Appendix D.

4.6.3 Validation of risk control measures

The effectiveness of the control measures shall be validated individually or in combination at different stages. Validation is concerned with actively obtaining evidence that existing or new measures are suitable to control a specific risk and to perform effectively under a range of conditions. Actively obtaining evidence regarding the performance of control measures can take a number of forms including both direct and indirect evidence. Examples are provided in Table 2.

Validation data shall be reviewed periodically and reflected in the WSP's risk prioritisation. The supplier shall ensure that earlier assumptions on the efficacy of control measures remain valid and up to date. Risk assessments shall be reviewed as improved knowledge is acquired (Figure 1).

Table 2: Examples of Direct and Indirect evidence for validation of performance

Direct Evidence	Indirect evidence
Date gathered during pilot studies where a range of typical operating conditions and potentially extreme events can be studied;	Published technical and scientific literature
Manufacturer validation of the process e.g. UV disinfection validation documents	Industry and regulatory published guidance
Ongoing monitoring of operational assets can take a number of forms for instance; submission of samples to a laboratory, on-line instrument data, alarm analysis,	Technical standards or design specifications e.g. Disinfection policies or UV protocols.
Physical inspection of assets e.g. service reservoirs integrity, filter performance.	

4.6.4 Implementation of additional risk control measures

Additional risk control measures or risk mitigation may consist of a range of measures, for example capital investment, changes to operating procedures or management processes, additional operational activities or Stakeholder engagement.

Each drinking water supplier will have an investment plan for delivering improvements (additional control measures) to the water supply system where risks are inadequately mitigated or where additional measures may improve the robustness of the existing controls.

Control measures may be categorised as short-medium- or long-term based on anticipated completion date or other criteria. For example, operational procedures may be considered a short-term measure, ongoing maintenance could be considered a medium-term measure with planned capital investment a long-term measure.

Following the implementation of additional risk control measures, the relevant risks shall be reviewed to facilitate re-prioritisation of remaining significant risks.

The details of the company's approach to implementation of control measures shall be detailed in the company methodology and/or strategy.

4.6.5 Operational monitoring of risk control measures

Risk control measures shall be monitored by the preparation of a routine monitoring programme. This shall include what is monitored and the frequency, to check that the WSP is effective and the risks adequately controlled.

Monitoring may include regulatory and/or operational sampling with a frequency applicable to the risk identified, visual inspection (physical checks), on-line monitoring, routine servicing and maintenance, and/or compliance with standard operating procedures.

Procedures shall be in place to ensure that any deviations from expected values or observations are acted upon in a timely manner to initiate corrective action.

4.6.6 Corrective action

Procedures shall be in place to identify anomalous situations, deviations from expected values or observations so that action can be taken in a timely manner to mitigate the risk. Corrective actions shall be documented.

Once corrective action has been implemented the risk shall be reviewed (Figure 1).

4.7 Verification of the risk management approach

Verification of the WSP approach shall be achieved by internal and external processes to ensure the drinking water supply system integrity and the continuous provision of safe and wholesome drinking water.

Internal processes for verification shall be described in the drinking water supplier's methodology. In addition to this methodology, operating procedures shall be in place to provide the detailed methods for verification of the risk assessment process.

In the case of parameters considered a low risk or that may be absent in the supply system, periodic review should be undertaken to verify there has been no change to status.

Internal audits which form part of a quality system shall be used as part of the verification process of the drinking water supplier's WSP. The audit process shall ensure that implementation of the risk management process has been completed as described and is consistently applied.

It should be noted that the risk management cycle is continuous and a risk assessment process should never be considered to have been completed. Both audits and improvement reviews shall be formally fed back into the WSP review process. They shall document which management measures have been verified.

4.8 Documentation

The drinking water supplier's methodology for their WSP shall be documented.

WSP risk assessments shall be recorded electronically so that they may be submitted in the format and frequency required by the Regulator and subject to any interim updates that meet the relevant triggers.

Audit trails shall be in place to record changes in risk and to demonstrate that the methodology is being followed. The documentation shall also cover the governance of the WSP process within the drinking water supplier's operation.

4.9 Review

The WSP risk assessments for individual supply systems shall be kept under review to ensure that they remain valid and fit for purpose.

The review process shall be specific for each drinking water supplier WSP. The methodology shall state the target frequency for review and set out the triggers for an interim review. These triggers may include:

- Changes to the supply system e.g. the introduction of new sources or rezoning of water to bring water from a neighbouring area.
- Legal and / or regulatory changes.
- In response to a failure of a control measure.
- In response to an infringement, actual water quality event/incident or near miss.
- Completion of remedial work, or introduction of a new control measure.
- In response to the findings of an audit or inspection

5. REFERENCES

This specification makes reference to the latest edition (except where otherwise stated) of the following publications, including all addenda and revisions which shall also be consulted.

British Standards

BS EN 15975-1:2013 Security of drinking water supply – guidelines for risk and crisis management – Part 1: Crisis Management 2013

BS EN 15975-2:2013 Security of drinking water supply – guidelines for risk and crisis management – Part 2: Risk Management 2013

International Standards

ISO/IEC 17020:2012 Conformity assessment – requirements for the operation of various types of bodies performing inspection 2012.

Legislation and associated guidance

DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2000 establishing a framework for Community action

in the field of water policy <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSL EG:2000L0060:20011216:EN:PDF> Accessed 21 August 2017

Water Supply (Water Quality) Regulations (Wales) (2010) <http://www.dwi.gov.uk/stakeholders/legislation/wsr2010wales.pdf>

Water Supply (Water Quality) Regulations (2016) <http://www.legislation.gov.uk/ukxi/2016/614/contents/made>

Water Supply (Water Quality) (Amendment) Regulations (2016) <http://www.legislation.gov.uk/wsi/2016/410/introduction/made>

Water Suppliers' (Information Direction) 2017 <http://www.dwi.gov.uk/stakeholders/information-letters/2017/01-2017-annex.pdf> Accessed 06 June 2017

Drinking Water Inspectorate: A brief Guide to Drinking Water Safety Plans (October 2005). <http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/Water%20Safety%20Plans.pdf> Accessed 06 June 2017.

Other guidance documents

World Health Organisation (2004) Guidelines for Drinking-water Quality. Third Edition. World Health Organization, Geneva.

World Health Organisation (2005) Water Safety Plans Managing drinking-water quality from catchment to consumer. http://www.who.int/water_sanitation_health/dwq/wsp170805.pdf

World Health Organisation, Guidelines for drinking water quality (2011) http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/

World Health Organisation Lexicon - <http://apps.who.int/thelexicon/entry.php> Accessed 22 February 2018.

World Health Organisation and International Water Association Water Safety Plan manual (WSP manual): Step-by-step risk management for drinking-water suppliers (2009) http://www.who.int/water_sanitation_health/publications/publication_9789241562638/en/

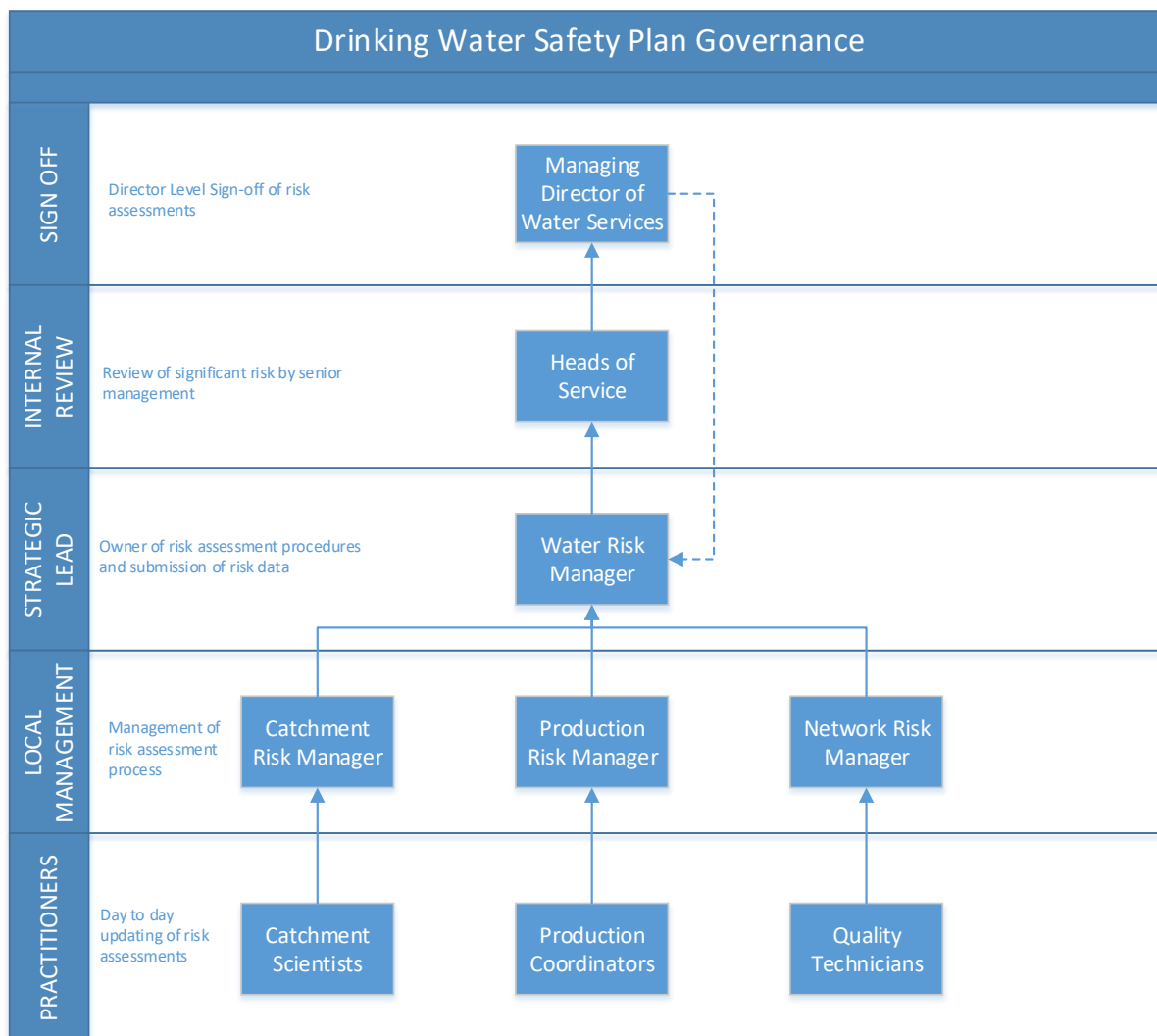
APPENDIX A – GLOSSARY OF TERMS

Table 3 provides a glossary of terms used within this document.

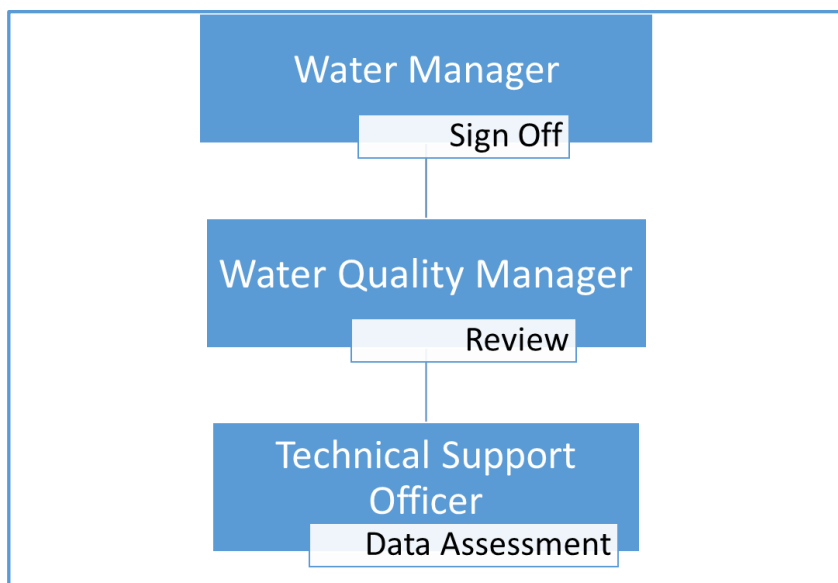
Table 3: Glossary of terms

Term	Definition for the purposes of this document
Additional Control measure	An extra activity or defence to mitigate the risk of a hazard or hazardous event occurring.
Asset	Within the context of this document it refers to a catchment area, a Water Treatment Works, Service Reservoir, Distribution network
Barrier	A measure put in place to reduce the risk of a hazard appearing in a downstream stage.
Consequence	The likely outcome if a particular hazard was present in the drinking water.
Drinking water supplier	Body responsible for delivering drinking water including Water Undertakers, licensed suppliers
DWI Category	Classification used by the Drinking Water Inspectorate on the nature of the risk e.g. Category A – adequately controlled.
Gross Risk	Also known as uncontrolled risk or pre risk. This is the risk score (likelihood x consequence) for a particular hazard with none of the existing control measures taken into account.
Likelihood	The probability of a hazard or a hazardous event being present or occurring, whether defined measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically
Residual risk	Also known as post control risk. This is the risk score (likelihood x consequence) for a particular hazard with all of the existing control measures taken into account.
Supply System	Group of assets that are connected from catchments through to Water Supply Zones to indicate the transfer of water from source to tap for a discrete area of the drinking water supplier's water network

APPENDIX B – CURRENT EXAMPLES OF ESTABLISHED TEAMS WITHIN DRINKING WATER SUPPLIERS UNDERTAKING WSPS



Example A



Example B

APPENDIX C – EXAMPLES OF RISK MATRICES

Likelihood	Consequence Type				
	No Detectable Impact	Compliance Impact	Aesthetic Impact	Regulatory Impact	Public Health Impact
0-1 years	5	10	15	20	25
1-3 years	4	8	12	16	20
3-10 years	3	6	9	12	15
10-30 years	2	4	6	8	10
>30 years	1	2	3	4	5

Example C

Hazardous event scoring example

Hazardous event likelihood

Score is derived by assessing the output of a WSP audit against defined criteria (example of criteria for a slow sand filter)

Hazardous event	Red Risk	Amber risk	Green
Example: Failure of slow sand filtration process	Significant regulatory infringements due to process deficiencies, widespread non-compliance with Operational Standard, significant media issues (e.g. bed depths significantly below minimum required in Operational Standard, significant media issues such as cracks, incorrect media spec. < or ineffective process control (e.g. inadequate flow control resulting in changes outside company standard, consistent non delivery of refurbishment and cleaning programmes) or key parameters measured at the outlet of slow sand filtration regularly outside trigger values.	Process deficiencies or poor process control impacting or likely to impact on quality of filtered water with key parameters measured at the filter outlet outside internal trigger values on occasions, however, no significant deviations from Operational Standard. Detection of parameters indicating excessive filter run times e.g. ammonia.	Minor process deficiencies or optimisation required. Occasional isolated breaches of trigger values.

Hazardous event Consequence Scoring Principles

Score	Definition
1	No public health, wholesomeness, regulatory or compliance impact.
2	Potential for minor impact on internal triggers.
3	Potential for minor regulatory or compliance impact and/or significant impact on internal triggers.
4	Potential impact on public health, wholesomeness or customer confidence, or moderate regulatory or compliance impact.
5	Significant potential risk to public health, wholesomeness, customer confidence, regulatory impact or compliance.

Example D

		Severity					
		Very low	Low	Moderate	High	Very high	
Likelihood	Score	1	2	3	4	5	
Very low	1	1	2	3	4	5	
Low	2	2	4	6	8	10	
Medium	3	3	6	9	12	15	
High	4	4	8	12	16	20	
Very high	5	5	10	15	20	25	
Definitions							
Likelihood	Score	Definition			Severity	Score	Definition
Very unlikely	1	May occur in exceptional circumstances, now or in the future. Less than once per year >99.9% compliance annually on treated water			Very low	1	Does not result in a breach of PCV or internal standard and does not pose any risk to quality of final water. Slight increases in metals, turbidity Low level pesticide detection
Unlikely	2	Unlikely to occur now or in the future Once per year >98% compliance annually on treated water			Minor	2	Bacti: Increased colony counts Turbidity: Failure of internal standard (0.3 NTU) Metals: Failure of internal standard (Mn 5ug/L, Fe 50ug/L, Al 50ug/L) Pesticides: Single breach of internal high limit General: Failure of internal standard Does not result in a loss of source, but comes close and results in the need for operational workarounds and/or increased cost of treatment.
Likely	3	Fairly likely to occur, under a reasonably wide range of conditions, now or in the future Once per month >95% compliance on treated water			Moderate	3	Bacti: Increased colony counts on multiple days Turbidity: Turbidity result or results over 0.5 NTU Metals: Single result over PCV Crypto: Crypto positive at a high risk site Pesticides: Multiple breaches of internal high limit General: PCV failure Temporary loss of a source which can be overcome by operational workarounds e.g. blending
Very likely	4	Likely to occur under most/all circumstances, now or in the future Once per week <95% compliance on treated water			High	4	Bacti: Coliforms, <i>E. coli</i> , clostridia, enterococci in WTW final water Turbidity: Turbidity result over 1 NTU (including Regulation 26 point) Metals: Multiple results over PCV Crypto: Crypto positive at a low risk site, multiple positives at a high risk site Pesticides: Single result over PCV (one or more pesticides) General: Multiple PCV failures
Almost certain	5	Is expected to occur in all circumstances Once per day Present in more than 90% of raw water samples or <90% compliance on treated water			Major	5	Bacti: Repeat detections or high levels of coliforms, <i>E. coli</i> , clostridia, enterococci in WTW final water Turbidity: Multiple turbidity results over 1 NTU (including Regulation 26 point) Metals: Regular metals results over PCV Crypto: Crypto positive >1 oocysts in 10L in WTW final water Pesticides: Regular results over PCV General: Regular PCV failures Potential long term loss of source

Example E

APPENDIX D – EXAMPLES OF CONTROL MEASURES

Catchment	Treatment	Storage	Distribution	Within Building
Catchment management plans to protect water quality Land owner engagement and education Reservoir management Protection at point of abstraction Safeguard Zones	Active abstraction management Optimised treatment processes Approved use of chemicals and products Systems to detect process or equipment failure with shut down of the works	Service Reservoir inspections (internal and external) Flood testing Vegetation and wildlife Management	Planned work risk assessments Mains cleaning Maintaining chlorine residual Pressure management Minimising flow changes Mains hygiene practices for repairs	Compliance with Water Fittings Regulations Consumer education on approved plumbers, approved products and how to look after water quality in the home