

Implementation Guidance:

Risk Assessment and Risk Management of Public and Private Supplies at Source





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2025

ENVIRONMENTAL PROTECTION AGENCY

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Reporting templates and can be downloaded from the following link.

<https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>

Acknowledgements

The preparation of this implementation guidance benefited from inputs and reviews by the individuals listed in **Table 1** (alphabetically, by entity and contributor). Several contributors also participated in the Drinking Water Source Protection Expert Sub-Group that previously worked to establish the drinking water source protection framework which is presented in the document 'Drinking Water Source Protection: Technical Guidance' (Department of Housing, Local Government and Heritage (DHLGH) 2024).

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Abbreviations

Abbreviations	Definition
ASSAP	Agricultural Sustainability Support and Advisory Programme
CSA	Critical Source Area(s)
CSMU	Catchment Science and Management Unit
DAFM	Department of Agriculture, Food and the Marine
DELG	Department of Environment and Local Government
DHLGH	Department of Housing, Local Government and Heritage
DWC	Drinking Water Catchment (same as a catchment of an abstraction point)
DWD	Drinking Water Directive
DWPA	Drinking Water Protected Area
DWSP	Drinking Water Safety Plan(s)
EC	European Commission
EPA	Environmental Protection Agency
EU	European Union
FSAI	Food Safety Authority of Ireland
GAP	Good Agricultural Practice
GSI	Geological Survey Ireland
GWS	Group Water Scheme(s)
ISPP	Integrated Source Protection Plan(s)
km	Kilometre
LAWPRO	Local Authority Waters Programme
mg/L	Milligrams per Litre
NFGWS	National Federation of Group Water Schemes
POM	Programme of Measures
PRCD	Pesticide Registration and Control Divisions of DAFM
RA	Risk Assessment
RBMP	River Basin Management Plan
RM	Risk Management
SI	Inner Protection Area
S.I.	Statutory Instrument
SO	Outer Protection Area
SPA	Source Protection Area
SPR	Source-Pathway-Receptor
SPS	Small Private Supplies
SPZ	Source Protection Zone(s)
SUP	Sustainable Use of Pesticides Regulations (S.I. No. 438 of 2019)
SUR	Legislative Proposal to Update the EU Sustainable Use of Pesticides Directive
UÉ	Uisce Éireann
µg/L	Micrograms per Litre
WHO	World Health Organization
WFD	Water Framework Directive
ZOC	Zone(s) of Contribution

Preface

This guidance document has been prepared in support of implementation of the European Union (Drinking Water) Regulations 2023, S.I. No. 99/2023. The guidance addresses risk assessment (RA) and risk management (RM) of public and private water supplies 'at source'. The term 'at source' refers to the catchment areas that contribute water to individual water supply abstraction points.

The guidance outlines and provides the relevant source protection agencies in Ireland with the data and information that are required to be able to fulfil regulatory functions and report on source RA and RM progress to the European Commission. Guided by existing mandates, the guidance also highlights the roles and responsibilities for implementation and oversight of S.I. No. 99/2023. Its content, therefore, enables source protection agencies to work towards common goals.

Finally, this guidance focuses on the source of water in catchment areas of abstraction points. It does not cover water treatment or the water distribution system downstream of treatment.

The guidance is not a legal interpretation of S.I. No. 99/2023. Therefore, although the guidance will be of significant benefit, not following it does not necessarily constitute non-compliance with legislation for drinking water source protection.

The latest Drinking Water advice and Guidance publications, including this document and its annexes, are located on the EPA website at this link:

<https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>

Section 1. Introduction

1.1 Purpose

The purpose of this implementation guidance is to present a standardised approach and methodology for conducting and reporting on the risk assessment (RA) and risk management (RM) of public and private water supplies 'at source', by:

- ▲ Considering the adopted drinking water source protection framework for Ireland, as presented in the document 'Drinking Water Source Protection: Technical Guidance' (DHLGH 2024);
- ▲ Building on past and ongoing water quality protection initiatives in Ireland, including the Water Framework Directive (WFD) implementation process; and
- ▲ Drawing directly on the requirements of the European Union (Drinking Water) Regulations 2023, S.I. No. 99/2023 (the Regulations).
- ▲ While water suppliers are provided with the flexibility to conduct source RA and RM activity within their own institutional structures and ongoing drinking water safety programmes, this document provides guidance on RA and RM content and reporting of outcomes. The aim is to achieve consistency to facilitate regulatory review and Ireland's reporting on drinking water RA and RM to the European Commission (as required by the Regulations).

As highlighted in the DHLGH publication cited above (DHLGH 2024), implementation of source RA and RM activity for drinking water source protection purposes is closely tied to implementation of the European Union Water Framework Directive (WFD). Several articles of the WFD contribute both directly and indirectly to the protection of waters intended for human consumption. Specifically, Article 4 of the WFD covers the setting of environmental objectives for protected areas (including drinking water protected areas); Article 5 addresses the characterisation and RA of environmental pressures and impacts; Article 7 establishes the requirement to protect drinking water sources; and Article 11 speaks to risk management through 'Programmes of Measures'.

1.2 Objectives

The principal objectives of this implementation guidance are:

- ▲ To document an agreed, standardised approach and methodology for RA and RM of public and private water supplies 'at source'.
- ▲ To document the data and information which will be submitted by water suppliers to the regulators; and
- ▲ To present RA and RM information in such a way that process, inputs and outcomes can be understood by everyone involved.

To meet the requirements of the Regulations, the standardised approach and methodology is:

- ▲ Risk-based; and
- ▲ Catchment-focused ('at source'), addressing RA and RM at abstraction points, i.e. before contaminants/pollutants reach the abstraction points.

This implementation guidance is entirely focused on risks to raw (untreated) water quality at abstraction points and in the catchments of abstraction points. As such, the risk of not providing adequate water treatment is considered, but the current guidance does not cover treatment directly or any risks or non-compliance that are associated with water storage and distribution systems.

1.3 Methodology

The content of the guidance is shaped by reviews of draft text and reporting templates, workshops, and online meetings which have covered:

- ▲ The requirements of the Regulations.
- ▲ Stakeholder roles and responsibilities.
- ▲ The current RA and RM practices of water suppliers and regulators, with specific insights from:
 - ▲ The Drinking Water Safety Plans (DWSP) prepared by Uisce Éireann (UÉ).
 - ▲ The Integrated DWSP and Integrated Source Protection Plans (ISPP) prepared by Group Water Schemes (GWS) under a national source water protection initiative led by the National Federation of Group Water Schemes (NFGWS).
 - ▲ EPA's Drinking Water Advice Note No. 8: Developing Drinking Water Safety Plans (EPA 2011). Accessible at: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice-guidance/epa-drinking-water-advice-note---advice-note-no-8.php>
 - ▲ EPA's online resources related to the protection of private water supplies, including information for the benefit of private well owners. Accessible from: <https://www.epa.ie/environment-and-you/drinking-water/>

The preparation of the guidance has also considered:

- ▲ World Health Organization guidelines on water safety plans and drinking water quality (WHO 2009, 2022, 2024). Accessible at: <https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/water-safety-and-quality/water-safety-planning>
- ▲ The existing Groundwater Protection Scheme guidance prepared by the then Department of Environment and Local Government (DELG), EPA and GSI (DELG/EPA/GSI 1999). Accessible at: https://www.gsi.ie/documents/Groundwater_Protection_Schemes_report.pdf
- ▲ Specification for the audit of water industry risk assessment and risk management processes, prepared by the UK Water Industry (WIS 2018). Accessible at: <https://standards-board.water.org.uk/document/wis-4-01-04-issue-1-specification-for-the-audit-of-water-industry-risk-assessments-and-risk-management-processes/>
- ▲ European Commission guidance on reporting under the recast drinking water directive (EC 2020). Accessible via: https://echa.europa.eu/legislation-profile/-/legislationprofile/EU-DRINKING_WATER_RECAST
- ▲ European Environment Agency guidance on the reporting of spatial data to the Water Information System for Europe (EEA 2016). Accessible at: <https://www.eea.europa.eu/data-and-maps/data/wise-wfd-spatial-1/documentation/wise-gis-guidance>

1.4 Definitions and Terminology

The Regulations call for a risk-based approach to drinking water safety that should be guided by the knowledge gained and actions carried out under the WFD. Implementation of the Regulations and the WFD is, therefore, linked as indicated graphically in **Figure 1**.

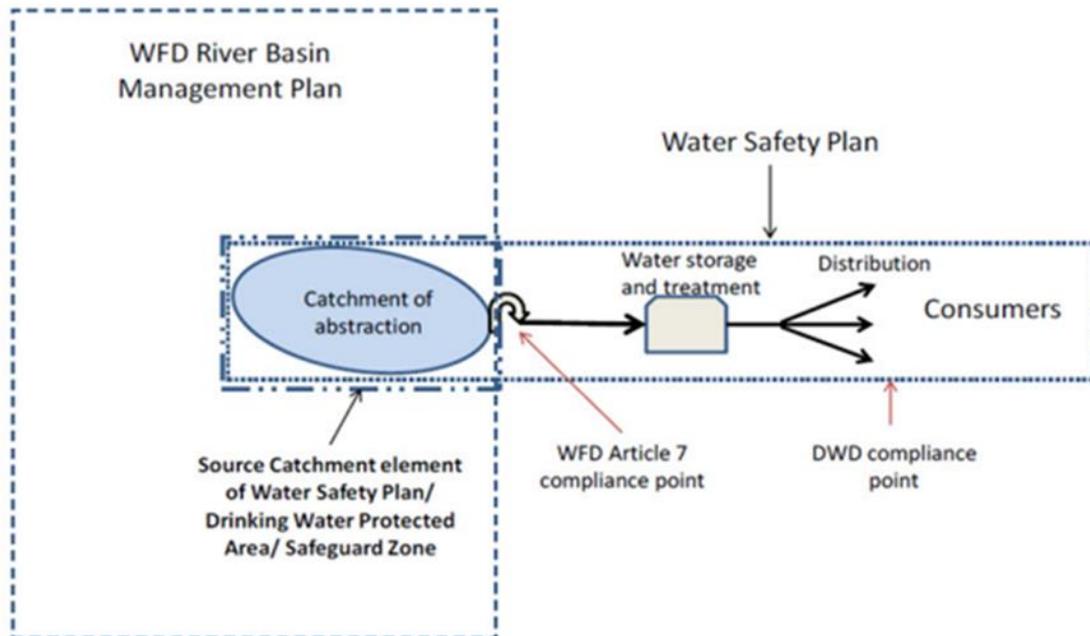


Figure 1: Relative Scopes of the Regulations and WFD (Adapted from Ferretti et al. 2016)

The Regulations are concerned with the catchments of abstraction points, also referred to as drinking water catchments (DWCs) (please refer to **Annex 1** and **Annex 4** for details). DWCs may be subsets of the water bodies (water management units) or groups of water bodies which are defined in Ireland for WFD reporting purposes.

Both the Regulations and the WFD include terms that are complementary but also sometimes contradictory. **Annex 1** presents the common terminology which has been adopted for this implementation guidance. The adopted terminology acknowledges the significant volume of source water protection work undertaken by others to date, including the GSI and DAFM. The terminology used in this document supersedes terminology used in previous linked or cited documents. Where there is a conflict in terminology, the terminology used in this guidance document will be the correct one.

Section 2. Implementation Approach

2.1 Introduction

The RA and RM implementation approach is depicted in **Figure 2**. It reflects the adopted drinking water source protection framework for Ireland, as presented by DHLGH (2024). As presented in **Figure 2**, RA leads to decisions about RM. The specifics of RM activity are informed by the objectives that are set, notably whether ‘Protect’ or ‘Improve’ objectives in a DWC apply, i.e. protecting or improving source water quality in DWCs. The setting of objectives is considered an especially important step in the RA process as it guides where greater RM effort may be needed or should be prioritised, like the ‘Priority Areas for Action’ (PAAs) that are defined in Ireland’s River Basin Management Plan (RBMP).

In DWCs where a ‘Protect’ objective is set, the objective is to manage conditions within that catchment such that existing water quality and associated risks to water supplies do not worsen or deteriorate. In such instances, the emphasis is placed on implementation of ‘preventive measures’ which are statutory in nature (i.e. defined by existing regulations; see **Annex 2 and Annex 3**). As stated by the NFGWS (2019), *‘Where [protect] is the objective, initial characterisation enables an understanding of the reasons for the satisfactory water quality as well as an evaluation of possible areas with associated pressures that are susceptible to impacts from present or future activities.’*

In DWCs where an ‘Improve’ objective is set, the objective is to manage conditions within that catchment such that risks are mitigated and/or confirmed water quality impacts are improved. In such instances, targeted, additional, and location-specific ‘mitigation measures’ (actions) may be necessary to achieve objectives (**Annex 3**), whereby precise locations of hazardous events may need to be confirmed via additional work (Further Characterisation), including sampling and monitoring. The potential need for establishing any hazard-specific safeguard zones also becomes relevant in this context (DHLGH 2024).

2.2 Roles and Responsibilities

Implementation of the framework in **Figure 2** requires the inputs and participation of many stakeholders. Roles and responsibilities for source RA and RM are presented in **Table 2** in the context of the source RA and RM implementation process which is depicted in **Figure 3**. In brief, water suppliers have responsibility for RA and RM of water supplies, including the preparation of source RA and RM plans and associated reporting to the regulators. During source RA and the preparation of source RM plans, water suppliers will work in collaborative partnerships with other parties (e.g. public or other scientific bodies) to gain access to and share relevant data, information, experiences, and expertise.

The measures that are recommended and targeted for implementation in each DWC will be defined in source RM Plans. The RM plans contain information on hazards, hazardous events, types and scopes of measures, and schedules, and identify implementing bodies, as appropriate.

Implementation of ‘preventive measures’, which are statutory, are the responsibility of statutory bodies (e.g. Local Authorities). Implementation of ‘mitigation measures’ (i.e. additional measures) will be coordinated by water suppliers but conducted in the field by other implementing bodies such as the Agricultural Sustainability Support and Advisory Programme (ASSAP) and the Local Authorities Water Programme (LAWPRO). Thus, implementation of ‘mitigation measures’ will be subject to availability of resources, agreements, and coordination by the water supplier.

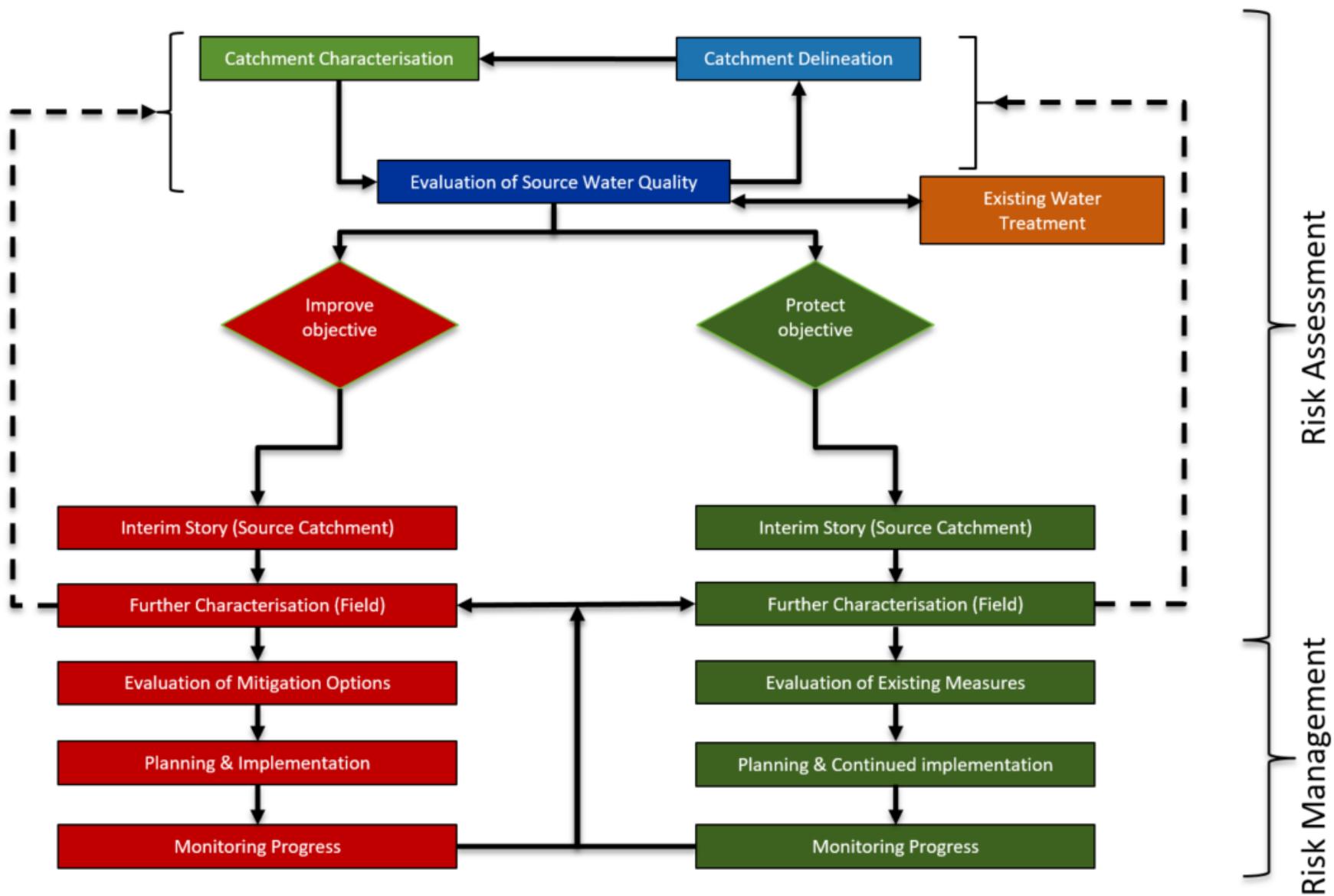


Figure 2: Drinking Water Source Protection Framework (Modified from NFWGS 2019)

Table 2: Stakeholder Functions

Agency/ Body	Responsibility
<p>Water Suppliers (UÉ and private GWS)</p>	<p>Source Risk Assessment:</p> <ul style="list-style-type: none"> ▲ Delineation and/or commissioning of DWCs.^[1] ▲ Raw/source water quality monitoring and evaluation of data. ▲ Characterisation of DWCs.^[2] ▲ Identifying hazards and hazardous events in DWCs. ▲ Setting ‘Protect’ or ‘Improve’ objectives for RM activity in DWCs. ▲ Identifying and preparing recommendations to address data and knowledge gaps, as a basis for Further Characterisation activity and/or enhanced or amended monitoring of raw/source water quality. ▲ Submitting RA templates to regulators (refer to Section 4). ▲ Submitting RA updates to regulators based on any changed conditions. ▲ Sharing of data and information with other source protection agencies as appropriate (e.g. in nested DWCs where private GWS may also operate). ▲ Informing the regulators of any raw/source water quality exceedances, trends, and unusual numbers. <p>Source Risk Management:</p> <ul style="list-style-type: none"> ▲ Initiating and preparing RM Plans for DWCs, in collaboration with other source protection agencies and organisations. ▲ Submission of RM template information to the regulators (refer to Section 5). ▲ Initiating and coordinating RM implementation, in collaboration with other source protection agencies and organisations. ▲ Reporting of RM progress to regulators (refer to Section 5). ▲ Submitting updated RM Plans based on any changed conditions. ▲ Maintaining ‘live’ RM plans through successive RM cycles. ▲ Tracking and documentation of RM progress. ▲ Communicating to regulators the needs for establishing hazard-specific safeguard zones within DWCs, as described in Annex 4 and by DHLGH (2024). ▲ Raw/source water quality monitoring and evaluation of data to judge effectiveness of RM measures. ▲ Sharing data and information with other source protection agencies as appropriate (e.g. in nested DWCs where private GWS may also operate). ▲ Informing the regulators of exceedances, trends, and unusual numbers or concentrations of water quality parameters.
<p>SPS</p>	<p>Source Risk Assessment and Risk Management (refer to Section 5):</p> <ul style="list-style-type: none"> ▲ Delineating DWCs using online resources available from GSI (Annex 4). ▲ Analysing raw/source water samples and making sure that treatment results in compliance at tap. ▲ Characterising abstraction points and their DWCs based on the methodology proposed in this guidance document. ▲ Submitting RA and RM reports to the regulator (Local Authority). ▲ Updating RA and RM reports based on any changed conditions. ▲ Facilitating any audits by Local Authorities.

Agency/ Body	Responsibility
EPA	<ul style="list-style-type: none"> ▲ Enforcing the Regulations with regards to public water supplies. ▲ Enforcing existing other legislation relevant to water resources and source water protection, including legislation that was introduced in context of the WFD. ▲ Complying with RA and RM reporting requirements to the EC. ▲ Supporting RA and RM activity by sharing WFD-related data, expertise and information with source protection agencies. ▲ Providing access to WFD App to UÉ, NFGWS, and LAWPRO. ▲ Defining and establishing hazard-specific safeguard zones, as referred by water suppliers and deemed feasible by EPA.^[3] ▲ Addressing queries, updates, non-compliance related to agency-issued discharge licences. <p>Furthermore, EPA <u>may</u>:</p> <ul style="list-style-type: none"> ▲ Issue further guidelines in relation to source RA and RM. ▲ Review RA and RM content, plans, and reporting by water suppliers. ▲ Request changes to raw/source water quality monitoring conducted by water suppliers. ▲ Assess any requests from water suppliers to adapt or change raw/source water monitoring requirements. ▲ Conduct oversight of the RM process and tracking of progress.
Local Authorities	<ul style="list-style-type: none"> ▲ Enforcing the Regulations with regards to private GWS and SPS. ▲ Enforcing existing other legislation that is relevant to water resources and source water protection (e.g. under the Water Pollution Act). ▲ Supporting RA and RM activity by sharing local knowledge and expertise, consistent with their roles and responsibilities under existing other legislation. ▲ Supporting other source protection agencies with relevant information that contributes to source water protection, if or as requested. ▲ Supporting the EPA with RA and RM reporting (e.g. submission of RA and RM plans prepared by the non-exempted water suppliers; tracking of progress). ▲ Supporting the EPA with the establishment of any hazard-specific safeguard zones. ▲ Prioritising any enforcement of measures established for hazard-specific safeguard zones, where these are established.^[4] ▲ With LAWPRO, supporting further characterisation activity or investigative assessments in support of RM implementation.^[5] ▲ Supporting the preparation of referrals and implementation of mitigation measures where 'Improve' objectives have been assigned.^[5] ▲ Addressing complaints and non-compliance events related to water supply and local authority-issued discharge licences, as well as farm inspections under the Good Agricultural Practice (GAP) Regulations. ▲ Potentially, preparing or supporting RA/RM reports for SPS (refer to Section 5). ▲ Enforcing 'preventive measures' related to the agricultural section in DWCs where 'Protect' objectives are assigned, with emphasis on the GAP Regulations.

Agency/ Body	Responsibility
LAWPRO	<ul style="list-style-type: none"> ▲ As a shared service for local authorities, LAWPRO will have a role in: ▲ Supporting source RA and RM in DWCs by sharing data, information, and expertise consistent with their roles and responsibilities under the WFD. ▲ Supporting water suppliers with source RM planning, by sharing data, information, and local expertise. ▲ Preparing referrals for ASSAP and other implementation bodies. ▲ Implementing further characterisation activity and/or source RM actions, as previously discussed, coordinated, and agreed with water suppliers – subject to available funds and resources. It is anticipated that LAWPRO will work primarily in DWCs with ‘Improve’ objectives. ▲ Providing updates and referrals for continued RM activity to private water suppliers and regulators as part of RM progress tracking and reporting.
NFGWS	<ul style="list-style-type: none"> ▲ The NFGWS is the representative organisation for community-owned GWS. In this role, the NFGWS <u>may</u>: ▲ Assist individual GWS with RA and RM activity, including DWC delineation. ▲ Coordinate and supervise the RA and RM process, by advancing the NFGWS’s existing source protection initiatives. ▲ Coordinate and supervise RA and RM reporting to regulators. ▲ Track and report on RM progress to regulators.
GSI	<p>Subject to available funds and resources, the GSI will have specific responsibility for:</p> <ul style="list-style-type: none"> ▲ Delineating DWCs for all groundwater-sourced abstraction points. ▲ Delineating DWCs involving karst settings and conjunctive use. ▲ Reviewing and approving third-party DWCs for all groundwater-sourced abstraction points prepared for/by water suppliers. ▲ Providing the means for SPS to delineate their DWCs using online tools (through the GSI website).^[6] ▲ Storing and maintaining a database of all DWCs and making these visible and accessible to the public, with ‘release notes’ (refer to Section 6).^[4] ▲ Supporting source protection agencies by sharing relevant data, expertise, and information relevant to source water protection. ▲ Supporting the EPA with the delineation of any hazard-specific safeguard zones or other ‘critical source areas’ (LAWPRO/EPA 2022) in a DWC. ▲ Supporting the water suppliers with the delineation or validation of surface water DWCs in ‘difficult’ physiographic settings, such as areas dominated by karst, or nested catchments.
DAFM	<ul style="list-style-type: none"> ▲ Enforcing ‘preventive measures’ related to the agricultural sector in DWCs where ‘Protect’ objectives are assigned, with emphasis on the GAP Regulations. ▲ Establishing and enforcing Pesticide Safeguard Zones within catchments of abstractions, per the Sustainable Use of Pesticides Regulations. ▲ Supporting water suppliers with the characterisation of DWCs, including Further Characterisation activity, specifically related to agricultural pressures. ▲ Assisting in preparing relevant referrals for continual improvements in the agricultural sector in DWCs in collaboration with the water suppliers. ▲ Maintaining and publishing the list of monitored pesticide active substances.

Agency/ Body	Responsibility
ASSAP	<p>Based on its advisory function, ASSAP may assist water suppliers with regards to:</p> <ul style="list-style-type: none"> ▲ The characterisation of DWCs for RA and RM reporting purposes. ▲ Further Characterisation activity related to the agricultural sector. ▲ Implementation of agricultural mitigation measures in DWCs where 'Improve' objectives are assigned, subject to agreed scopes and schedules with water suppliers (based on ASSAP or water supplier referrals), and subject to availability of funds and resources. ▲ Supporting the water suppliers with the tracking of progress of measures and preparing relevant referrals for continual improvements in the agricultural sector.
HSE	<ul style="list-style-type: none"> ▲ Assisting in the protection of public health by advocating for safe drinking water. ▲ Assessing public health risks, agreeing mitigation actions, and providing health advice for drinking water supplies, per existing drinking water-related legislation. ▲ Responding to drinking water incidents when they occur, in the manner that HSE carries out its responsibilities under existing legislation.
DHLGH	<p>The Minister has responsibility for establishing, formalising, and overseeing the implementation of the Regulations and for ensuring that the Regulations are integrated with the implementation of the WFD RBMP. In this capacity, the Minister may:</p> <ul style="list-style-type: none"> ▲ Maintain national oversight of progress with implementation of the drinking water source protection framework and the Regulations. ▲ Assist with establishing safeguard zones, where required. ▲ Provide advice or support to source protection agencies in the planning or implementation of source RM measures where resources are not available or cannot be agreed upon.

Notes:

1. DWCs of surface water abstractions are delineated by water suppliers. DWCs of groundwater abstractions are delineated by GSI in collaboration with water suppliers. DWCs involving karst settings and conjunctive use will also be prepared by GSI. Water suppliers may request GSI's assistance in validating surface water DWCs and/or DWC delineation in nested catchments where multiple abstractions are present, overlap or may influence one another.
2. As a basis for completing the ranking of risk factors per the proposed, standardised risk assessment methodology (refer to Section 3).
3. Except for pesticide safeguard zones, establishing hazard-specific safeguard zones currently does not have legislative footing. New legislation and implementation guidance would be required. GSI has proposed groundwater protection responses (see Annex 4).
4. Enforcing any new hazard-specific safeguard zones (other than pesticide safeguard zones) currently does not have legislative footing. New legislation and implementation guidance would be required.
5. Subject to agreed scopes and schedules, and availability of resources.
6. Most SPS are groundwater abstractions. An online and publicly available delineation tool will be developed and maintained by GSI.

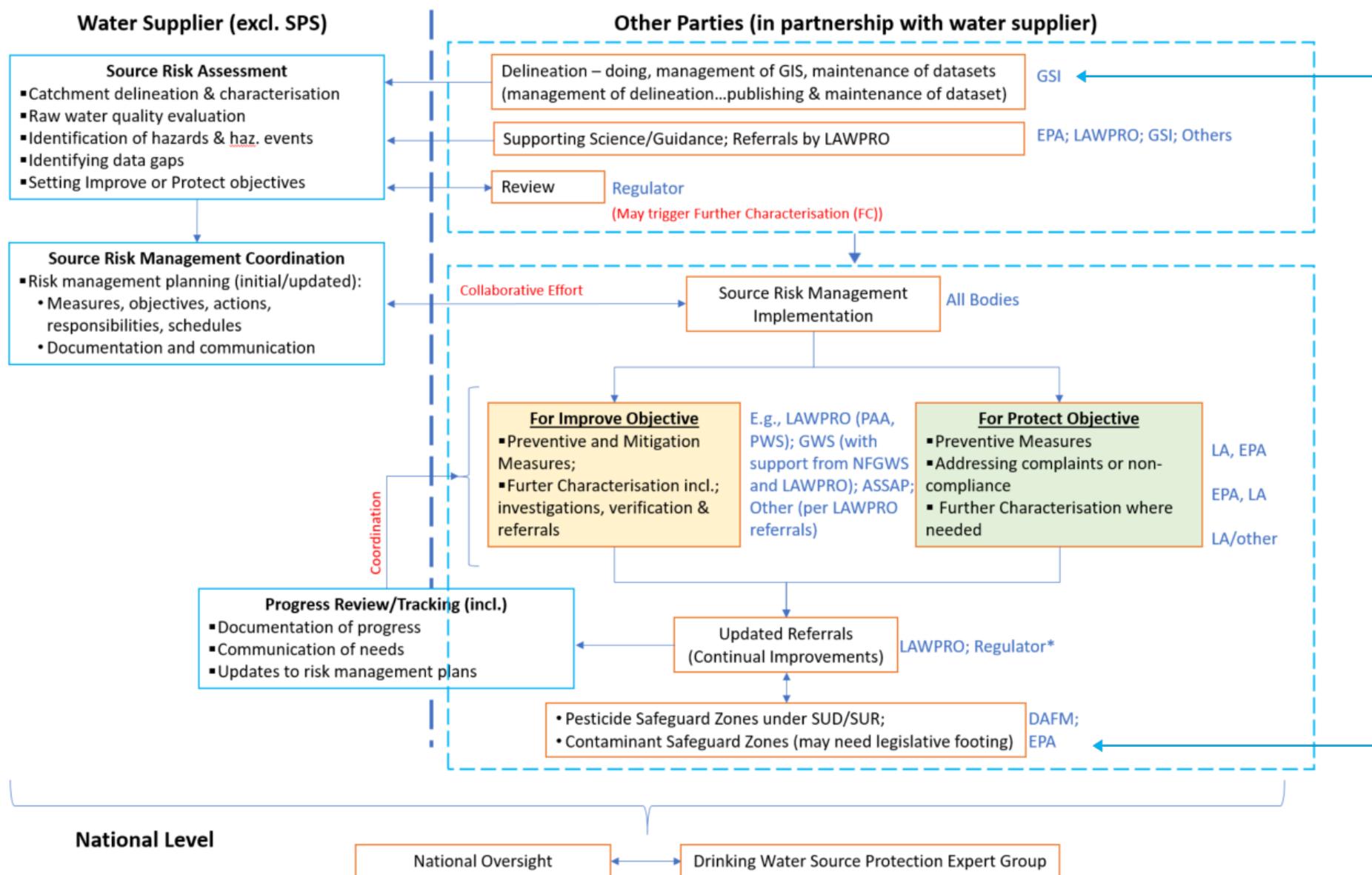


Figure 3: Stakeholder Functions and Structure of Framework Responsibilities (DHLGH 2024)

The needs and scopes for 'mitigation measures' are defined in the first instance by the water suppliers but can also be prompted for or instructed by the regulator. For implementation, the water suppliers may approach other source protection agencies and implementing bodies for assistance. Ensuing RM plans may be developed in coordination with such bodies, subject to further scoping, discussion, scheduling, and agreement. Whether a 'mitigation measure' can or will be implemented will hinge on agreements between parties and their capacity to conduct the identified scopes, and it is acknowledged that actual implementation may be constrained by the priorities and resources of the implementing bodies. Any identified, necessary, or recommended actions that do not gain traction or are not acted upon can become subject to regulatory review and further decision-making at a national supervisory level. The DHLGH will maintain a national oversight role for the implementation of the Regulations (please refer to **Table 2** and **Figure 3**).

Section 3. Methodology – Risk Assessment

3.1 Overview

Drinking water safety in Ireland is steered by the Water Safety Plan Manual published by the World Health Organization (WHO 2024). Largely based on the initial WHO manual (WHO 2009), the EPA produced the 'Drinking Water Advice Note No. 8: Developing Drinking Water Safety Plans' (EPA 2011). Advice Note No. 8 outlines the steps that are involved in constructing drinking water safety plans (DWSP) in the Irish context.

Both UÉ and NFGWS are at present actively engaged in systematic drinking water safety planning, consistent with WHO guidance and Advice Note No. 8. As the EPA promotes WHO's DWSP approach, Advice Note No. 8 serves as an appropriate reference document for RA and RM of drinking water supplies.

In relation to the drinking water source protection framework in **Figure 2**, the RA is conducted after DWC delineation and relies on information collated as part of catchment characterisation. The RA also makes use of raw (untreated) water quality to the extent that this is available, to verify the presence and nature of hazards.

The RA methodology for source water involves judgement of risks that 'hazardous events' (environmental pressures and sources of contamination) may or do affect source water quality (judged at the abstraction point). A non-exhaustive list of hazardous events to be considered is provided in Tables 1 through 6 of Appendix 1 of Advice Note No. 8. In the advice note, the listing is by 'hazard descriptions', and each hazard description has been assigned a risk code.

The hazardous events are systematically reviewed by assigning the *likelihood* of the hazardous event being present or occurring (score from 1 to 5) and the *severity* of consequences (score from 1 to 5) should the event occur. The two are multiplied together to form a risk score, and the outcome and relationship between likelihood and severity are presented in **Table 3**, as reproduced from Advice Note No. 8.

Table 3: Risk Assessment Matrix (from EPA Guidance Note No. 8)

			Severity/Impact of Consequence				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
Likelihood	Almost certain	5	5 (L)	10 (M)	15 (H)	20 (VH)	25 (VH)
	Likely	4	4 (L)	8 (M)	12 (H)	16 (VH)	20 (VH)
	Foreseeable	3	3 (L)	6 (M)	9 (M)	12 (H)	15 (H)
	Unlikely	2	2 (L)	4 (L)	6 (M)	8 (M)	10 (M)
	Most unlikely	1	1 (L)	2 (L)	3 (L)	4 (L)	5 (L)

The risk scores of each event considered are then used to judge which events pose the greater risk to source water quality. Tables 1 and 2 of Appendix 2 of Advice Note No. 8 provide suggested descriptors of likelihood and severity for guidance. It should be noted that the suggested descriptors include statements on treatment and disruption to consumers from the distribution system, which are not relevant to the source water RA.

The water supplier may decide to amend the descriptors of likelihood and severity to align better with their experiences. In such cases, the descriptors must be communicated clearly as part of the RA reporting.

The risk scoring is undertaken by a risk assessor who relies on data and information, and local knowledge and judgement of conditions within the DWC. Advice Note No. 8 acknowledges that the Appendix 1 listing of hazardous events may not capture every possible risk that is present in the DWC. Moreover, the list *'is not exhaustive and additional hazards can be added by the water supplier where they are specific to a supply. Similarly, not every hazard on the list will apply to each water supply.'*

As such, variation on what is considered and presented is permissible, provided it is clearly documented, and the general risk rating process is followed.¹ It is acknowledged that UÉ is currently working with sets of hazard descriptions which have been updated and slightly amended from Advice Note No 8. In the pending RA reporting, it will be important that descriptions are clearly presented.

Having undertaken the risk scoring, the ranking of risk scores can subsequently be used to steer appropriate focus areas for RM actions in the DWC. To help presentation of the RA outcome, risk scores are presented in a tabular form, but the RA outcome can also be presented visually by showing the distribution of risks as shown in the example in **Table 4**, using traffic light colours to differentiate between low, moderate and high risk.

Table 4: Example of Combining Risk Scores for Individual Hazardous Events in a Summary Matrix

Risk Assessment Matrix			Severity/Impact of Consequence				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
Likelihood	Almost certain	5				1	4
	Likely	4					2
	Foreseeable	3				2	3
	Unlikely	2				3	
	Most unlikely	1		1	2	10	7

The matrix summarises how risk was scored. High-risk hazardous events plot in the upper right, in the red fields. In the example in **Table 4**, four hazardous events had a risk score of 25. To find out which four events were assigned this risk score, the reviewer would refer to the risk scoring sheet. This is included with the RA reporting template which is presented in Section 3.3. As each water supply scheme is risk-scored by the same approach and methodology, relative scores between schemes allow for visual comparison, which draws focus and can be helpful for prioritising which schemes require greater attention for RM.

Lastly, and because RA is risk-driven, appropriate monitoring at source will be needed to confirm the RA and to verify the presence of specific hazards.

That said, it is acknowledged that even if risk or hazards are identified, impacts may not be realised in the drinking water supply. This is because the DWSP will cover treatment and the distribution systems also, hence the water supplier will evaluate the risks. The provision of adequate treatment may eliminate risks to consumers.

3.2 RA Information to be Captured and Reported

The minimum information to be captured by the RA process for any given abstraction point is defined in Regulation 10(4) of the Regulations. The information derives from:

- ▲ Delineation of DWCs, which defines the geographic area(s) that contribute(s) water to abstraction point(s).
- ▲ Source water quality monitoring² and evaluation of data, for identification/verification of potential hazards and the associated hazardous events.
- ▲ Characterisation of the abstraction point and its DWC, for the understanding of risk (hazards and hazardous events) and how best to address risk (RM).

¹ Further amendment to Advice No. 8 may be published by the EPA in the future based on, for example, updated guidance by WHO and/or subsequent experiences with implementation of the Regulations.

² Regulation 10(4)(c) – ‘appropriate monitoring in surface water or groundwater, or both, in the catchment areas for abstraction points, or in raw water, of relevant parameters, substances or pollutants selected from the following:’

The three components are described in detail by DHLGH (2024). A checklist and RA summary template is presented in **Table 5**. The water supplier uses the table to check that all relevant information is provided and communicates the principal findings to the regulator. The regulator uses the table: a) to check that all relevant RA information has been considered; b) to flag items that require follow-up (for clarification or further information); and c) to review the RA as a basis for RM plans. The checklist function of **Table 5** is combined with a checklist for RM reporting in **Annex 5** (Tab 'RA and RM Checklist'). The RA summary components of **Table 5** are derived from the information provided in **Annex 5**, which is submitted to the regulator (see Section 4.3).

Table 5: Checklist and Summary of Risk Assessment for Public Water Supplies and Group Water Schemes

Item	Specification	Information to be Provided
Water Supply (Zone) Code	[code]	Per drinking water returns
Water Supplier	[name]	
Scheme Name/Water Supply Zone	[name]	UÉ or GWS name, as applicable
County	[name]	
Date submitted to Supervisory Authority	[date]	
Person responsible for submission	[name]	Contact details
Was the source RA submitted due to a changed condition?	Y/N	RA and RM plans should be submitted every 6 years, at a minimum. If a changed condition with the abstraction of source waters occurs, the water supplier must judge the need for updates to the RA and RM plan. The regulator can also request updates based on audits or learning of changes. A changed condition can be an addition or removal of an abstraction point; significant changes to abstraction rates (averages, maxima) of existing abstraction points; or configuration/layout of abstraction points. Judging significant changes to abstraction rates is subjective.
Does the source RA have a DWC delineated?	Y/N	Should be Y in all cases. If N, then a DWC should be delineated, and may be requested by the regulator.
Was a raw/source water quality evaluation conducted?	Y/N	The evaluation should be based on raw water samples from the DWC and ideally the abstraction point. If EPA data are used, then the regulator may judge the appropriateness of the data used (e.g. if they are too distant from the abstraction point). If an evaluation was not conducted, then justification should be provided, e.g. a low-risk catchment, to be sampled subsequently.
Is the raw/source water quality evaluation based on data from the abstraction point?	Y/N/Partially	If N, give the ID of the monitoring station and its coordinates. If partially, briefly explain the data available (e.g. which parameters).

Item	Specification	Information to be Provided
Are there data/information gaps in the raw/source water quality evaluation?	[specify]	This is a judgement call, by both the water supplier and the regulator. The judgement reflects the availability of data and the characterisation of the DWC, and perceived or confirmed risks. Test related to selection of parameters to be analysed is in Section 3.5.
Are there exceedances of screening thresholds?	Y/N	Exceedances here refer to exceedances of surface water and groundwater environmental quality standards (EQS) and/or the screening thresholds presented in Template 5. This does not refer to exceedances of compliance values at tap.
Parameters with exceedances	[list]	Listing of those parameters that have exceeded the screening thresholds presented in Annex 5 .
Are there upward trends of any parameters?	Y/N	These pertain to any available data series. If data are insufficient for trend analysis, then this should be stated. Refer also to Annex 5 for description.
Parameters with upward trends	[list]	List here any specific parameters with upward trends.
Are there unusual numbers or concentrations of parameters in the datasets?	Y/N	Unusual numbers are outliers or spikes in data series, or values that fall outside of normal ranges. They do not speak to the sudden appearances of contaminants, rather the behaviour of parametric values.
List parameters with unusual numbers or concentrations	[list]	Identify here the parameters with unusual numbers that are identified from available datasets. Unusual numbers are outliers or spikes in data series, or values that are out of normal ranges.
Do data gaps, exceedances, trends, or unusual numbers in available datasets at source present a risk to the delivery of safe water?	Y/N	This is a judgement call, by both the water supplier and the regulator. It speaks primarily to what is known about raw water quality in context of the types and levels of treatment provided. Any identified data/knowledge gaps may trigger the need for Further Characterisation. An example would be the detection of MCPA in raw water samples, knowing that the treatment plant does not offer treatment of MCPA.
Source RA outcome (highest overall risk score for any identified hazardous event)	L/M/H/VH	This is determined by the highest risk scores for any identified hazardous events (Table 3). If raw water quality data contradict the RA, then this information can be used to adjust the risk assignment, provided it is justified.
Identified hazards	[specify]	List here any specific, identified hazards. This should be confirmed from raw water data.

Item	Specification	Information to be Provided
Hazardous events that drive the RA	[specify codes]	List here the suspected or confirmed hazardous event(s) in the DWC that give rise to the identified hazard(s) and risk – refer to Annex 5 . This is informed by DWC characterisation and first-hand knowledge of the DWC.
Is further characterisation (FC) recommended?	Y/N	This is a judgement call, by both the water supplier and the regulator. FC is relevant when or where data or knowledge gaps emerge. If Y, then the recommended FC should be identifiable in the RM plan.
Determination of overall source RM objective	Protect/Improve	This is a judgement call by both the water supplier and the regulator. The determination is informed by the RA, especially the review of exceedances, trends, and unusual numbers in raw water quality data but also knowledge of events or circumstances that may not (yet) be supported by the available data (e.g. visible discolouration of raw water, algal blooms).

For the evaluation of raw/source water quality, preference and priority should be given to raw water at the abstraction points, although data from within the DWC may also be used, noting that this information is subject to Regulation 10(7), whereby *'The source protection agencies shall select from paragraph (4)(c)(i) to (vii) the parameters, substances or pollutants that are considered relevant for monitoring in light of the hazards and hazardous events identified under paragraph (4)(b) or in light of the information provided by the water suppliers in accordance with paragraph (6).'*

Regarding frequency of source raw water sampling, it should be risk-based, and water suppliers should be satisfied that the source raw water data are representative of source water quality and hydrochemistry. The sampling may need to establish a baseline for currently identified or future parameters or react to an event. It may need to be increased or decreased accordingly.

Where data from the broader DWC are used, information on whose data and which stations are used must be clearly identified and shown. Such data must be evaluated and presented considering distance from the abstraction point, position with the DWC, and land uses and environmental pressures which may affect the data, as well as any intervening land uses and environmental pressures between the monitoring station and abstraction point. Where distances are 'great', the data may not be representative of the raw water quality at the abstraction point. Judging this requires expertise and experience by the risk assessor. Consultation with specialists may be necessary.

As such, the characterisation of each DWC may result in the identification of data and knowledge gaps, and these can serve as the basis for Further Characterisation activity to reduce uncertainty or address specific queries that may arise (per the implementation process in Section 3.2).

As indicated by Regulations 10(5) and 10(6) of the Regulations, the RA can and should make use of information collated by the EPA for WFD reporting purposes. The RA process requires two-way data and information sharing between source protection agencies, as appropriate.

3.3 RA Reporting Template

The reporting template for RA, as **Annex 5** to this guidance, is presented with the guidance document as an Excel spreadsheet which can be downloaded from the following link:

<https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>

The template reflects the information that regulators will need to:

- a) Check or otherwise audit water supply risk(s).
- b) Track RA information over time.
- c) Report on RA findings to the European Commission (EC), in accordance with Regulations 13 and 16.

The template is arranged by tabs, each containing specific information, as follows:

- ▲ 'Scheme info' – this tab contains the water supply scheme code and name, and an estimate of the number of persons served.
- ▲ 'Abstraction Info' – this tab identifies the individual abstraction points in the scheme, the source water and abstraction types, abstraction rates, and the WFD water management units they are associated with.
- ▲ 'DWC Info' – this tab presents information on the DWCs for individual abstraction points in the scheme, their unique identification codes (to be determined), the individual who delineated the DWC, and the filename of the DWC shapefile which has been prepared and submitted with the RA report. The tab also includes a listing of any composite or nested DWCs, if applicable. Bulk uploads of multiple DWCs in the same shapefile may be considered.
- ▲ 'RA Scores' – this tab provides the risk scoring information for the hazardous events which were considered in the RA. If any specific events were not considered, the hazardous event should still be listed but the risk scores will be 'n/a'.
- ▲ 'WQ Sample Locations' – this tab itemises the water quality sampling stations that were used in the raw water quality evaluation, within the DWC and/or at the abstraction points. It also identifies the data types and data source.
- ▲ 'WQ Data Screening Values' – this tab lists data screening values that are used by NFGWS and UÉ for common pollutants (hazards) in the Irish context. They serve as guide values for flagging potential issues with source water quality. They are not equivalent to the parametric values listed in the Regulations, which are compliance values (at tap). As stated by NFGWS (2019), the use of guide values or source water quality evaluation is consistent with the *'WFD implementation approach where there are either environmental quality standards or threshold values for pollutants, which are used as a target that needs to be reached from the WFD management strategies and measures.'* The listed parameters are indicator parameters of hazardous events that may cause health-based incidents or affect water treatment plants. The itemised screening values are sourced from the NFGWS and UÉ, noting that they are similar. It is acknowledged that the use of guide values for flagging potential hazards in a DWC (for RM planning purposes) will require technical judgement, in terms of both the parameters being checked and the screening thresholds that are applied. As further stated by NFGWS (2019), the use of guide values *'may need to be varied depending on the site specific conditions that have been assessed during the characterisation process'*.

- ▲ 'WQ Data Summary' – this tab includes a listing and annotation of any exceedances of screening/guide values, trends, and unusual numbers, along with notes on whether any derogations apply. The information presented is based on the data evaluation which is conducted by the water supplier. While the reporting tab focuses on exceedances, trends, and unusual numbers, the water supplier may provide additional water quality details if there are aspects of the RA which are important to the RA but, in the view of the water supplier, not adequately conveyed by the exceedances, trends, and unusual numbers. An example could be documentation of low concentrations or non-detections of parameters that document either lack of impact or the absence of a hazardous event in a DWC. This is at the discretion of the water supplier.

Parametric failures and health-based incidents occurring within the reporting period are also to be reported, albeit separately, recognising that there is already a mechanism in place for reporting of incidents between water suppliers and the regulators. Such incidents can be at source, at the treatment plant, or in the water distribution system leading to non-compliance at tap. An illustrative incident at source could be an accidental spill of hazardous materials from an overturned truck.

Along with the water quality data summaries, the water supplier will be required to submit the underlying data to the regulator electronically. It is anticipated that instructions on means and methods of data transfers will be subject to a separate initiative which is not covered by the current guidance (refer to Section 6).

3.4 RA Schedule

RA of DWCs must initially be completed by 12 July 2027 under Regulation 9(4). Thereafter, RA shall be reviewed and updated at regular intervals of 'not greater than six years', or 'where necessary'. The reference to '*not greater than six years*' is consistent with the WFD river basin management planning cycle.

The term 'where necessary' refers to changed conditions with the water supply scheme or hazardous events in the DWC. Changed conditions can occur at any time between the mandatory six-year update periods. In source water terms, changed conditions would principally refer to changes in the configurations of abstractions and abstraction rates. In such instances, the delineation of DWCs must be updated along with an updated characterisation of the DWCs as part of the updated RA.

Changed conditions in the DWC would mainly refer to the occurrence or identification of new hazards and hazardous events in the DWC, such as a land use change (deemed significant) or facility that can affect source water quality.

For practical reasons, and because changed conditions can occur anytime and multiple times over a six-year reporting period, the water supplier may, on a case-by-case basis, seek clarification from the regulator as to if or when updated RAs will be necessary.

3.5 RA Water Quality Monitoring

Schedule 6 of the Regulations provides that the EPA may issue guidelines in relation to RA and RM which include monitoring in the catchment or in raw water. Publicly available WFD-related monitoring data from the EPA and Local Authorities may also be used for source RA and RM purposes. However, this alone may not be sufficient to adequately characterise or verify the risks to a water supply or efficacy of RM measures. It is considered best practice to monitor raw water quality at or near abstraction point(s), to inform the RA and/or to verify a RA. The EPA's Advice Note No. 8 (Table 1, Appendix 1) includes the '*absence of characterisation of the raw water source*' as a risk item to be considered.

Raw (untreated) water quality monitoring is addressed in Regulation 10(4)(c). Reference is made to '*appropriate monitoring*' of parameters, substances and pollutants which are to be selected from sets of tables and other regulations that are itemised in Regulation 10(4)(c). Regulation 10(7) also states that source protection agencies shall select parameters, substances, or pollutants that '*are considered relevant for monitoring in light of the hazards and hazardous events identified under paragraph (4)*'

(b) or in light of the information provided by the water suppliers in accordance with paragraph (6)'. Paragraph (4)(b) relates to the 'identification of hazards and hazardous events in the catchment areas for abstraction points and an assessment of the risk they could pose to the quality of water intended for human consumption'. Paragraph (6) refers to 'the review of the impact of human activity' and information that is gained from both RM activity and WFD implementation. There is, therefore, technical judgement involved in raw water monitoring, which is driven by risk identification.

Although taken from a document which pre-dates the Regulations, Appendix 2 of the drinking water source protection framework report by NFGWS (2019) provides a list of suggested parameters for raw (untreated) water quality monitoring, divided into four: i) microbiological analysis, ii) an *'essential suite'* of physico-chemical parameters, iii) an *'additional'* suite of parameters, and iv) provision for *'other organic pollutants where risk is indicated during the characterization process'*.

Scope for amending monitoring is also provided in Regulations 10(13) and 10(14), whereby monitoring of raw water quality at abstraction point(s) and/or in DWCs can be changed in time. The Regulations refer to potential additional monitoring by water suppliers and/or potential decrease of monitoring frequency or removal of certain parameters from monitoring based on RA and RM findings and outcomes.

Regulation 13 details further requirements in relation to raw/source water monitoring, including actions required in relation to exceedances of guidance values for watch list substances or compounds.

For RA purposes, treated water results (compliance and any other available) can be used with raw water samples as well. If for example there are nitrate or pesticide issues in the treated water, then it is likely that there will be a need for an 'Improve' objective, irrespective of raw water samples.

A central platform hosting all relevant data is not yet available, hence agreements for data sharing between source protection agencies are necessary. The EPA currently provides the WFD-related data through individual requests, the WFD App, or via the website www.catchments.ie. This is further described in Section 6.

Section 4. Methodology – Risk Management

4.1 Overview

RM addresses the outcomes of RA. The focus will be on identified hazards and hazardous events that generate the highest overall aggregate risk scores. RM is a process which is initiated, coordinated, and tracked by the water supplier, and relies on the collaboration, availability, capacity, and active participation of implementing bodies (other than the water suppliers).

- ▲ RM is described in Regulation 10(10) and covers both ‘preventive’ and ‘mitigation’ measures, as referred to in Section 2.1. An overview of preventive measures and the resources that are available for both the planning and implementation of mitigation measures is provided in **Annex 3**.

The drinking water source protection document prepared by the NFGWS (2019) and the guidance handbook on catchment science and management by LAWPRO/EPA (2022) provide helpful information on practical aspects of the RM process, describing principles, approaches, and methods for identifying mitigation measures (actions beyond the mandatory/statutory). Moreover, the integrated source protection plans that have been prepared by the NFGWS to date offer valuable insights into what is involved in implementing RM initiatives. Mitigation measures must be technically justifiable, targeted to specific issues in defined areas, affordable, and ‘tested’ for community/individual acceptance to be achievable.

4.2 RM Information to Be Captured and Reported

RM is a risk-based process. Although there are many factors that can affect source and drinking water quality, not every hazard or hazardous event will require the same degree of attention. The RA methodology in Section 3 ranks the identified risks by likelihood of occurrence and the inferred severity of consequences if the hazard occurred. RM thus distinguishes between the more and less important hazards or hazardous events.

The water suppliers are responsible for preparing RM plans and assume a coordinating role for implementation of mitigation actions, especially those which are not of a statutory nature. It is recognised that implementation of mitigation actions is dependent on the participation of other implementing bodies. How this is initiated and implemented is left to the water suppliers. Both UÉ and the NFGWS have potential mechanisms in place, which have been trialled in workshop and stakeholder focus group settings. Such initiatives could form the basis for suitable collaborative frameworks between stakeholders.

RM planning requires consultation with regulators and, potentially, public bodies and researchers with topic-specific and site-specific knowledge. Collaborative effort results in selection of appropriate and workable measures. The RM plan defines agreed scopes, responsibilities, and target schedules. A RM checklist is presented in **Table 6**. This checklist is combined with the RA checklist in **Annex 5** (tab ‘RA and RM Checklist’).

RM plans are specific to an abstraction point and the hazards and hazardous events which were identified during RA within the DWC. The RM plans are submitted with the RA. Where DWCs overlap or are nested (Section 6.5), integrated RM plans may be considered. In such cases, the RA and RM checklist should identify which specific supplies are included.

Table 6: Checklist for Risk Management of Public Water Supplies and Group Water Schemes

Item	Specification	Information to be Provided
Is the source RM plan complete?	Y/N	If N, describe missing items and plans for next steps.
Have implementing bodies been identified for all recommended measures?	Y/N/Partially	If N or partially, address or explain circumstances.
Are agreements in place for implementation of all recommended measures?	Y/N/Partially	If N or partially, address or explain circumstances.
Are schedules of proposed or confirmed actions defined?	Y/N	If N, revise or explain circumstances.
Are Safeguard Zones proposed?	Y/N	If Y, list the recommended action(s).
Are there gaps in the source RM Plan?	Y/N	If Y, summarise what they are and potential consequences. This is a judgement call by the RA assessor and regulator.
Do the gaps present a risk to delivery of safe water?	Y/N	This is a judgment call, by both the water supplier and the regulator. If Y, propose a course of action. This can be anything deemed relevant – e.g. lack of water quality data, missing information related to RM actions, lack of documentation of treatment provided, or adequacy of treatment provided.

General approaches for selecting appropriate measures are described by NFGWS (2019), LAWPRO/EPA (2022), and DHLGH (2024). As intended by the Regulations, measures can build on and take advantage of any existing WFD programmes of measures (POMs) within the DWC. Any such POMs will need to be contextualised for the risks that are identified by the RA process. The synergy between the WFD and the Regulations provides opportunity for collaboration and facilitation of information exchange, noting also that Regulations 10(10)(a) and 10(10)(b) refer to preventive and mitigation measures being included in POMs for WFD implementation purposes.

Mitigation measures will be focused on DWCs with Improve objectives, and related actions will be targeted, specific, and localised to address specific hazards and hazardous events. They may, however, also be defined in DWCs where Protect objectives are set, e.g. where water quality data for a given hazard(s) show an upward trend. Some mitigation measures may also be relevant on a national scale.

Finally, RM Plans are 'live' documents. They are updated and tracked throughout consecutive implementation cycles and modified as changed conditions occur, actions are completed, or new referrals for actions are identified and fed back from implementing bodies to the water supplier.

4.3 RM Reporting Template

The reporting template for RM is included with **Annex 5** of this guidance document, and is downloadable as an Excel spreadsheet from the following link:

<https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>

The RM templates are identified in the tabs:

- ▲ ‘RM Plan’ - this provides information on each recommended RM activity for a given reporting period; the target schedules of individual measures within the reporting period; the implementing body (based on prior consultation and agreement); and information on any potential constraints that may impede implementation (e.g. funding or other resource requirements). The RM measures address specific hazards and hazardous events that have emerged from the RA.
- ▲ ‘RM Plan Tracking’ – this serves as an evaluation form. It documents progress (or not) with the specific measures of the RM plan. It considers the effectiveness of measures, any lessons learned, and new recommendations for actions that may emerge from RM activity in the previous reporting period. In such cases, the learning and new recommendations are transferred to the RM plan for the subsequent implementation cycle.

The water suppliers may opt to complete the information to a level they deem appropriate, recognising that the RM plan and tracking will be subject to review. The template in **Annex 5** reflects the information that the regulator will need to:

- a) Check RM activity, track progress, and audit the RM process.
- b) Help to advance specific recommendations which are beyond the water supplier’s control (e.g. establishment of safeguard zones).
- c) Report on RM activity to the EC, in accordance with Regulation 16.
- d) Help facilitate coordinated WFD implementation, i.e. river basin management initiatives, as well as WFD reporting to the EC.

RM plans for DWCs with ‘Improve’ objectives will likely be more extensive in scope than those with ‘Protect’ objectives, thus also requiring more effort and allocation of resources. RM plans should consider any RM actions that are already underway as part of WFD implementation within the DWC. This information can be sourced from the EPA (with access to WFD App, see Section 6) and Local Authorities (via LAWPRO).

It is acknowledged that reporting on RM in large DWCs with multiple hazards and hazardous events, and with complex overlapping issues, may be difficult to distil into a simple template. Accordingly, judgement by the water supplier will be required to capture and document the relevant information in a suitable format, e.g. as separate reports or an amended template which maintains the recording of the key information presented in **Annex 5**.

Per Regulation 10(11), the effectiveness of any selected RM measure shall be reviewed at ‘*appropriate intervals*’, which is inferred to be every six years or less (in line with reporting to the EC) or as changed conditions in the DWC occur. Therefore, information on progress with RM activity will be recorded, and shall be available to regulators as part of the RM reporting. Reporting on progress occurs after the first cycle of implementation. In time, RM measures are tracked and updated, with successive annotations on progress, constraints, lessons learned, and new recommendations. The lessons learned and recommendations will serve to update the RM plans for subsequent cycles of RM implementation.

In cases where implementation of agreed RM activity is impeded or not progressing according to target schedules, the reason(s) should be communicated through the RM tracking. If reasons are related to a lack of resources, then the implementing body, supported by the water supplier, may need to initiate steps to secure the necessary resources via their parent body.

4.4 RM Schedule

Like RA, RM for all DWCs of water intended for human consumption must initially be carried by 12 July 2027, and RM shall be revisited and updated at regular intervals of *'not greater than six years'*, or *'where necessary'* (refer to Section 3.4).

4.5 RM Water Quality Monitoring

Raw (untreated) water monitoring will also be necessary during RM to be able to judge the effects of measures. As such, the RM process will also deliver raw water quality data. Like RA, any data generated during RM produced by the water supplies can be requested by the regulators and source protection organisations.

The scope of sampling during RM will be guided by the hazards and hazardous events identified during RA. As described in Section 3.5, the relevant terms used in the Regulations are *'appropriate monitoring'* for *'relevant parameters, substances and pollutants'*. Regulation 10(10) also refers to *'appropriate monitoring'* as a risk management measure.

Section 5. Small Private Supplies

5.1 Identification and Registration of SPS

SPS provide drinking water to the public mainly through commercial activities. Examples are hotels, bed and breakfasts, pubs, schools, and nursing homes. SPS do not include private household wells, which are exempted from the Regulations.

According to the latest drinking water quality report by EPA on private GWS and SPS (EPA 2024), the number of SPS registered with Local Authorities was 1,665 in 2023. A similar number, 1,778, was reported for 2019 by Tobin (2022). The total number of SPS around the country likely changes in time and there are many SPS that are not registered with Local Authorities (hence they are also not monitored). Accordingly, SPS also are underrepresented in EPA's register of abstractions.³

Further effort will, therefore, be necessary to identify, register, and monitor SPS, especially those that have their own water supplies. After that, updated registers of SPS abstractions will need to be maintained. It is considered that Local Authorities are best placed to initiate surveys of SPS, since Local Authorities have responsibility for the regulation of SPS.

5.2 Approach to RA and RM

RA and RM will be required of any non-exempted SPS that abstracts water intended for human consumption. The approach towards RA and RM of SPS is like that of larger water supplies, but the scope of assessment and reporting is less. This is because most of the known, registered SPS abstract small quantities of water. SPS owners will also mostly be unfamiliar with the requirements of the Regulations. The RA and RM methodology and reporting for SPS are described in Section 5.3.

There is no firm abstraction threshold that applies for SPS. Most SPS abstractions are small (<50 m³/d) and derived from groundwater via wells/boreholes (Tobin 2022). That said, there are also known, registered SPS which abstract larger quantities from surface water, and in such instances, the regulator may deem it more appropriate to require RA and RM per Sections 3 and 4.

It should be mentioned that there are private GWS that also abstract small quantities of water. For such schemes, the regulator may be satisfied by the same RA and RM procedure that is outlined in Section 5.3.

Like RA and RM for public water supplies, RA and RM for SPS and private GWS is risk-based. In addition to the consideration of abstraction rates (and accompanying area covered by the associated DWC), the RA and RM of SPS in karstified limestone may require greater scrutiny than a similar SPS in a non-karst setting. This is because of the pathway consideration of karst, whereby contaminants can travel long distances over short periods of time (NFGWS 2019; LAWPRO/EPA 2022).

³ Registration of abstractions ≥ 25 m³/d is required as set out in S.I. No. 419/2024 – Water Environment (Abstractions and Associated Impoundments) Regulations 2024. Thus, EPA's register captures abstraction of 25 m³/d or greater. Many SPS abstract less than 25 m³/d.

5.3 RA and RM Methodology and Reporting

RA of SPS must cover the same three basic components described in Section 3.2, namely:

- ▲ Delineation of a DWC.
- ▲ Evaluation of raw/source water quality.
- ▲ Characterisation of the abstractions point and its DWC.

This presents a challenge, as few SPS owners have the required information or knowledge to conduct RA and RM without assistance. Accordingly, it is envisaged that these tasks will be conducted by others, on behalf of the SPS owners (see Section 5.4), with support from GSI. Delineation of groundwater-based DWCs requires professional judgement by experienced hydrogeologists, and this becomes especially important in karstified limestone settings. GSI is the obvious resource for related consultation and assistance. It is anticipated that GSI will make a DWC delineation tool available online which the public (e.g. consultants) can access. Any DWC that is generated and submitted with an RA and RM report will be saved on GSI servers. All DWCs delineated by GSI or others in this manner will be allocated a unique DWC reference code by GSI.

The evaluation of water quality should be based on both raw/source and tap water samples. A minimum of one test result should be provided for each, and the samples should be taken within one year of the RA being submitted. Sampling and testing of both raw and treated water are in the owner's interest for verification purposes and also serve as an RM measure. If hazards(s) or non-compliance at tap is identified, then the supplier should take a second sample for verification purposes. The owner can also seek advice from the Local Authority or HSE on the need for conducting additional monitoring or possible corrective action.

Water quality data produced by the SPS or private GWS must be accessible to the Local Authority. The means and methods of data submissions and getting raw water data into Local Authority databases (e.g. LabWorks) will need to be established, separate from the current guidance.

The water quality evaluation must include technical judgement of the level of treatment that is provided or may be necessary to deliver drinking water safely. For this reason, the RA and RM will need to be completed and signed off by a suitably qualified person.

The characterisation of the abstraction points and DWC should consider the same risk factors that public water supplies and private GWS consider as part of their DWSP. However, because abstraction rates are typically much smaller, the risk factors will most often be of a localised nature. In such instances, and where the supply is derived from wells/boreholes, the RA and RM of SPS can take advantage of the web-based risk assessment tool for private wells that was recently launched by EPA, at the following link: <https://eparesearch.epa.ie/water/wells%20/survey.php>

A checklist of items to be considered in the preparation and review of the RA and RM report is presented in **Table 7**.

Table 7: Checklist for RA and RM of SPS and small private GWS

Item	Specifics	Information to be Provided
Scheme name	Name	
Owner/operator	[name, contact]	Both the owner and anyone involved in operations should be identified.
Was the source RA and RM report prepared due to a changed condition?	Y/N	Per the Regulations, the RA must be updated when a changed condition occurs. This is considered to mean a change in the configuration of abstractions, and either an addition or removal of a source of drinking water. It could also apply to a change in abstraction rates. For example, the addition or replacement of a borehole means that a new DWC must be delineated, accompanied by raw water quality evaluation, and characterisation of the DWC. A changed condition only occurs in relation to what was submitted for a previous RA.
RA and RM report prepared by	[name, contact]	
Date prepared	[date]	
Was a DWC delineated?	Y/N	if N, revise.
Were raw/source water quality data presented?	Y/N	If N, revise.
Was the sample taken within one year of the report date?	Y/N	If N, retake and resubmit.
Are there any exceedances of parametric values, trends, or unusual numbers in the raw/source water?	Y/N	If Y, list the identified hazards and exceedances. Here, the exceedances refer to the screening values in Annex 6 . If trends or unusual numbers emerge over time, these need to be listed also in subsequent reports.
What treatment is currently provided?	[specify]	Describe the level of treatment provided (e.g. filtration, oxidation, disinfection with chlorine, UV).
Do exceedances present a risk to delivery of safe water?	Y/N	This is a judgment call by the risk assessor and/or Local Authority. It considers the level of treatment provided.
Is tap water compliant with parametric values?	Y/N	This requires that tap water be sampled and monitored. If N, source RM must be practised and improved treatment must be provided.
Are RM actions clearly identified?	Y/N	If N, revise.
Do RM actions have clearly defined target dates?	Y/N	If N, revise.

5.4 RA and RM Reporting for SPS

An RA and RM reporting template for SPS is provided as **Annex 6** with this guidance. The template can be downloaded as an Excel file from the following link:

<https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>

The **Annex 6** template includes the checklist above and tabs, as follows:

- ▲ 'Supply Info' – for basic information on the supply, including name, contact, abstraction type, estimated total abstraction rate, and no. of people served.
- ▲ 'Abstraction Info' – abstraction information, which is different from 'Supply Info' and only relevant if there are more than 1 no. abstraction points in the supply.
- ▲ 'DWC Info' – information on the DWC which has been delineated, including name of the person who conducted the delineation and the filename of the DWC that was submitted with the RA and RM report.
- ▲ 'WQ Sample info' – information on the sample points that were used.
- ▲ 'RA RM Report' – this tab is the basic report which summarises the water quality evaluation, adequacy of treatment provided, the assessment of hazardous events in the DWC, and the recommended measures to address risk and any hazards that may emerge from the water quality evaluation.

Given the technical nature of the information which must be considered, it is anticipated that RA and RM reporting for SPS can be completed by these options:

1. Local Authorities conduct the RA and RM reporting on behalf of SPS, as county-wide initiatives.
2. Local Authorities or another public body issue tenders for suitably qualified persons or firms to conduct RA and RM reporting on behalf of SPS.
3. SPS owners are tasked with the reporting, in which case they will likely have to engage suitably qualified persons or firms to prepare and submit RA/RM reports on their behalf. It is recognised that this will place financial constraints on SPS owners.

Because RA and RM content and reporting require trained eyes, the RA and RM report that is either submitted to or prepared by Local Authorities must clearly identify the risk assessor.

5.5 Existing Available Resources to Support RM of SPS

RM guidance documents which have already been prepared for private well supplies and which are relevant to SPS (and small private GWS) are:

- ▲ The Water Forum publication on the protection of SPS: https://www.thewaterforum.ie/app/uploads/2021/07/Andrade-et-al._Report-Water-Quality-of-Small-Private-Supplies.pdf
- ▲ EPA Advice Note 14 on borehole construction and wellhead protection: https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/EPA_DrinkingWater_AdviceNoteNo14b_web.pdf
- ▲ IGI guideline on drilling and installation of boreholes/wells: <http://igi.ie/assets/files/Water%20Well%20Guidelines/Guidelines.pdf>
- ▲ EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Private Water Supplies. Accessible from: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/epa-private-water-supplies-handbook.pdf>
- ▲ EPA public awareness campaign on protection of private wells: <https://www.epa.ie/environment-and-you/drinking-water/household-wells/>

The EPA also produces annual drinking water-related reports which can be searched and downloaded from this link: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/>

The EPA report series 'Focus on private water supplies' contains helpful advice on risk assessment and risk management topics. The latest available report is for 2020, accessible at: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/drinking-water-quality-in-private-group-schemes-and-small-private-supplies-in-2020.php>

The EPA also produces annual drinking water-related reports at the national scale which can be searched and downloaded from the following link: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/>

Finally, the HSE provides relevant, helpful information on drinking water and health, including risk of illness from well water, at the following link: <https://www.hse.ie/eng/health/hl/water/drinkingwater/well-water.html>

Section 6. Data and Information Sharing

Data sharing and dissemination of information is referred to in Schedule 4 (Information to the Public) and Schedule 6 (Source Protection) of the Regulations, as well as in Regulations 10, 13, 14, 16 and 33. Regulation 16 specifically addresses the sharing of data with the European Commission, the European Environment Agency and the European Centre for Disease Prevention and Control.

6.1 Sharing Among the Source Protection Agencies

Data sharing and dissemination of information among Source Protection Agencies is necessary for effective and transparent implementation of the Regulations. The intent and objective are to leverage synergies among the agencies for improved and coordinated decision-making.

Relevant avenues for data and information sharing are listed below, for illustration purposes. The list is not exhaustive.

- ▲ Water suppliers will require access to WFD data and the catchment characterisation information that resides with EPA, for example in WFD App.
- ▲ EPA and Local Authorities require access to raw water data and other information that water suppliers use for RA and RM reporting.
- ▲ GSI will require access to abstraction source information (e.g. locations, borehole/spring details, logs, abstraction rates) and water quality information from RA/RM for the purposes of DWC delineation/review.
- ▲ Implementing bodies of RM actions require access to RA data, as prepared by water suppliers. They will also require access to the RM plans prepared by the water suppliers.
- ▲ Based on findings and lessons learned, implementing bodies will feed information, experiences, outcomes, and referrals for further actions or amended programmes of measures back to the water suppliers.

For data and information sharing to occur seamlessly, agreements and mechanisms of collaboration and sharing will need to be in place between the relevant bodies. This is additional to the already publicly available information, such as the national GIS coverages maintained by the EPA and GSI.

The RA reporting to regulators includes data summaries, with exceedances, trends, and unusual numbers highlighted. If requested by the regulator, the parameters selected by the water supplier for monitoring and their results must be available in suitable (workable) formats, such as Excel. Going forward, the methods, means, and modalities of data sharing will need to be discussed and agreed to by the water suppliers and regulators, recognising that different databases and data management systems are currently in use and new ones may be required. This topic is beyond the scope of the current guidelines and may require that a separate data/IT project be initiated which manages and delivers data in ways that suit all parties and maintains quality control standards for accuracy and processing purposes. Thus, the EPA will be required to present required metadata structures to the water suppliers, subject to EC guidance, such as the 'Guidance on the reporting of spatial data to the Water Information System for Europe', available at the following link: https://cdr.eionet.europa.eu/help/WFD/WFD_780_2022/GISGuidance/WISE_GIS_Guidance.pdf

Raw/source water data produced by water suppliers should be reported using a spatial code which is a unique ID assigned to each abstraction point. The ID can be generated by the water supplier and must be used consistently. If data are taken from other parties, and unique IDs are not available, then the data source and station location must be clearly presented. This has been considered in the reporting templates in **Annex 5**.

6.2 Information to the Public

Schedule 4 of the Regulations specifies the types of information that shall be accessible to the public. Further information can also be requested by the public through the Freedom of Information Act (FOIA) and/or the Access to Information on the Environment (AIE) Act. Any data or information requested are subject to the European Union (General Data Protection) Regulations S.I. 679/2016, as amended, also referred to as 'GDPR'.

6.3 The Planning Process

For DWCs to become more visible and understood in the public domain. They will be made publicly available so that they can be viewed and considered in future planning applications and associated EIAs. All DWCs will be maintained by GSI and made accessible for viewing through GSI's web viewer. GSI will provide a description of the related GIS layer, complete with disclaimers, via the web viewer (see also Section 6.4).

The presentation and use of DWCs will be accompanied by 'release notes' which will outline what the DWCs are, the context in which they were produced, and what they mean practically. Essentially:

- ▲ The DWC is the area that provides water to the abstraction point and defines the area subject to preventive and mitigation measures under relevant legislation (**Annex 3**), as supervised by regulatory bodies.
- ▲ Proposed new projects which are being processed under planning law must not result in hazards or hazardous events which can present undue risk to the source water quality of the abstraction point(s) associated with the DWC.

Upon establishing a system for making DWCs accessible, An Bord Pleanála (renamed An Coimisiún Pleanála under the 2024 Planning and Development Act) and local authorities will be informed. The intent is for DWCs to be afforded consideration in local, county, and national planning processes in a consistent manner nationally. It is anticipated that an information campaign, including training, may be necessary, both to make the DWCs visible and to make their function understood.

6.4 Data Protection Requirements

Implementation of the Regulations must satisfy the GDPR.⁴ It will be incumbent on each source protection agency to put in place the appropriate checks or controls for this purpose.

⁴ Personal information cannot be shared. Information on abstractions can be shared among public authorities with responsibility for water management in Ireland, such as local authorities, government departments, and state bodies. This is laid out in Regulation 6 of the European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018).

6.5 Nested Drinking Water Catchments

There are instances around the country where abstraction points are present within the DWCs of other abstractions, giving rise to 'nested DWCs'. One example is the Belturbet PWS, a surface water abstraction point (river intake) on the Upper Erne drainage system in Co. Cavan. Being a river abstraction, the DWC of the abstraction is deemed to be equal to the surface water catchment of the abstraction point (**Figure 4**).⁵ The DWC is large, occupying a total area of approximately 1,500 km². It encompasses both surface- and groundwater-based water supplies, specifically five other PWS, 16 GWS, and several registered SPS.

At the Belturbet PWS, MCPA is being detected in raw/source water samples, and the task at hand is to identify where MCPA applications occur and how to mitigate. Even if the Belturbet PWS example is inherently complex because of the size of the DWC, the required approach is to work systematically through all the nested DWCs for other abstraction points and WFD subcatchments so that synergies in data and information can be achieved. Precisely how this is managed and implemented is up to the water suppliers, which are responsible for coordinating RM. Nested DWCs offer opportunities for collaboration and coordination, including sharing of data, information, and experiences among the source protection agencies. In the Belturbet example, the RA and RM can both benefit from, and can feed into, the RA and RM of the other water supplies.

⁵ Prepared specifically for this document to exemplify a complex, nested catchment scenario.

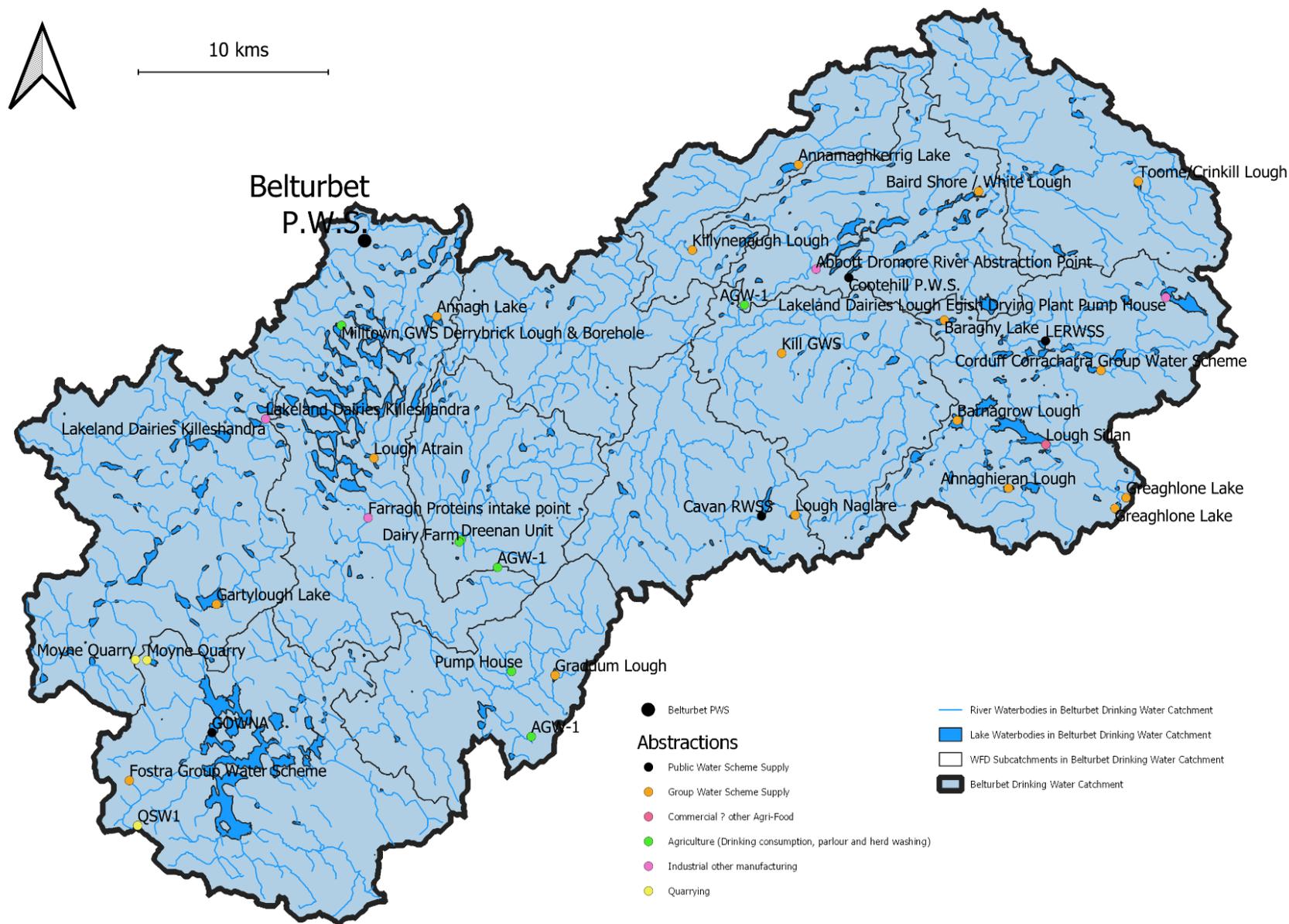


Figure 4: The Surface Water DWC of the Belturbet PWS

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Annex 1: Definitions and Terminology

1.1 Overview

This guidance engages with catchments of abstraction points that supply drinking water supplies. To avoid confusion with the abbreviation 'COA', which the EPA uses for 'certificate of authorisation', the catchments of abstraction points will be referred to as Drinking Water Catchments (DWCs). As indicated in Figure 1, DWCs are areas that are either upstream (surface water) or hydraulically upgradient (groundwater) of water supply abstraction points and may be subsets of water bodies or water management units which are defined in Ireland for WFD reporting purposes.

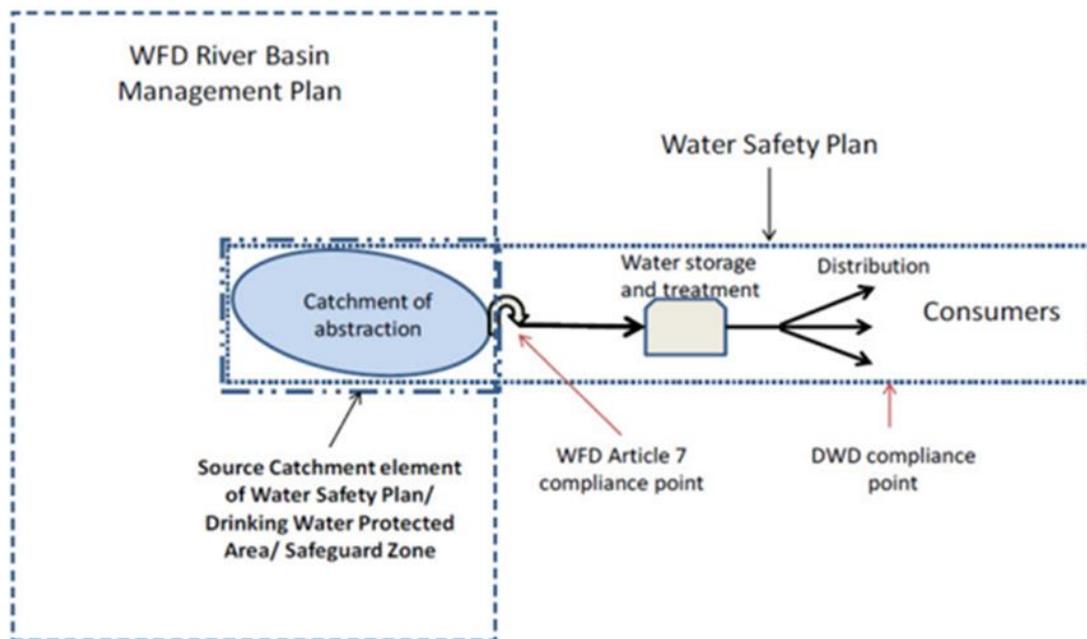


Figure 1: Relative Scopes of the Regulations and WFD (after Ferretti et al. 2016)

1.2 Adopted Terminology

Commonly used terms in the Regulations and WFD that have been adopted for clarity purposes in this guidance are described below.

1.2.1 Water Suppliers

For the purposes of this guidance, water suppliers are:

- ▲ Uisce Éireann.
- ▲ Group Water Schemes (GWS) – both private and public GWS (represented by the NFGWS).
- ▲ Small Private Supplies (SPS) – these are drinking water supplies serving a commercial or public activity such as hotels, pubs and restaurants, crèches and national schools. SPS are generally owner-managed and -operated. The owner or manager of the activity manages the abstraction, treatment, and delivery of the water.

SPS do not include:

- ▲ Water supplies operated and/or provided by UÉ.
- ▲ Water supplies operated and/or provided by a GWS.
- ▲ Household water supplies served by private wells or another source, serving single dwellings.
- ▲ Water supplies to the food industry.

1.2.2 ‘Supervisory Authorities’

In the Regulations, the regulators are referred to as the ‘supervisory authorities’, as follows:

- ▲ For public drinking water supplies operated or supplied by UÉ: EPA
- ▲ For private GWS: local authorities
- ▲ For SPS: Local Authorities.

Enforcement powers for regulation and control of activities that address pollution of source waters are given by the legislation that is presented in Annex 2. Both EPA and local authorities have legal enforcement powers related to drinking water supplies under the Regulations, including regulations and actions within the catchments of abstraction points (refer to Section 1.2.11).

Thus, notices can be served by the EPA on UÉ and by the Local Authority on non-exempted SPS or private GWS to prepare ‘*action programmes*’ (remedial actions) that will bring supplies up to the necessary drinking water standards as soon as possible. GWS must prepare their action programmes in consultation with the local authority.

The Pesticide Registration and Control Divisions (PRCD) of DAFM is the only stakeholder with enforcement powers for pesticide use and applications. Issues relating to the impact of plant protection products on drinking water supplies (as well as aquatic habitats) are dealt with in EU and national legislation on the sustainable use of pesticides. A legislative proposal from the European Commission for an EU Regulation on the sustainable use of pesticides (SUR), to replace the current Sustainable Use of Pesticides Directive (SUP – Directive 2009/128/EC), was published in June 2022 and is currently being discussed with Member States. The SUR will include measures to protect drinking water supplies that will be legally binding on Member States, such as the establishment of a minimum mandatory buffer zone for all surface water bodies and will also enable Member States to introduce additional measures to protect both the aquatic environment and drinking water supplies.

Since EU Regulations are directly applicable in national law, they do not need to be transposed. However, DAFM plans to update existing national legislation to help implement and give further effect to various measures in the SUR, including measures relating to the protection of drinking water supplies and their abstraction points. It is, therefore, important that drinking water source protection measures factor in statutory measures that will be included in new EU and national legislation.

The new national legislation will give the Minister of Agriculture powers to specify measures to protect drinking water supplies, like those included in current national legislation (S.I. 438 of 2019 European Communities (Sustainable Use of Pesticides) (Amendment) Regulations 2019). These include establishing pesticide safeguard zones for any water bodies, where needed, based on scientific information and analysis. It is worth noting that powers ‘to increase the protection of water sources used for the abstraction of water for human consumption from pesticide use’ are already given in S.I. 438 of 2019.

1.2.3 Source Protection Agencies

Source protection agencies are defined in the Regulations as ‘*agencies or organisations that have been allocated a role in the risk assessment and risk management of the catchment areas for abstraction points of water intended for human consumption*’.

In Schedule 6 of the Regulations, the named source protection agencies are UÉ, EPA, local authorities and GSI. It should be noted that private GWS also have allocated roles in RA and RM and are often represented by the NFGWS. However, neither GWS nor the NFGWS are named in the Regulations as they do not have legal status as they are not public bodies. For the purposes of this guidance, GWS and the NFGWS are considered source protection agencies, by virtue of their function as an important water supplier.

1.2.4 Water Supplies Exempted from the Regulations

There are three categories of exempted supplies, as summarised in Table 2. Per the Regulations, exemption cases 1 and 2 are in effect as of 10 March 2023, while exemption case 3 will come into effect on 13 January 2026.

Table 2: Exemptions Specified in the Regulations

Exemption Case	Definition	Comments
1	Individual supply <10 m ³ /d (average) or serving <50 persons, as part of a commercial or public activity.	These supplies are subject to Regulations 4, 5, 6, 7, 13, 17 and 18, and the relevant Schedules.
2	Individual supply <10 m ³ /d (average) or serving <50 persons, but: Is <u>not</u> used as part of a commercial or public activity; Is used exclusively for purposes in respect of which the relevant supervisory authority is satisfied that the quality of the water has no influence, either directly or indirectly, on the health of the consumers concerned.	--
3	Food business operator ⁶ with its own water supply, in relation to the water used for the specific purposes of the food business.	Food Safety Authority of Ireland (FSAI), or an official agency of the FSAI carrying out functions under a service contract pursuant to section 48 of the FSAI Act 1998 (No. 29 of 1998), is satisfied that— (i) the quality of the water supply cannot affect the safety of the foodstuff in its finished form, and (ii) the water supply of the food business complies with relevant obligations, in particular under the procedures on hazard analysis and critical control point principles, where applicable, and remedial actions under relevant legislation on food.

1.2.5 Drinking Water Safety Plans

Drinking Water Safety Plans (DWSP) are a strategy, approach and methodology for assessing and managing the risks to a drinking water supply, with the objective of providing 'safe' and 'secure' drinking water (WHO 2022). DWSP cover both RA and RM, which is acknowledged in the Regulations. Uisce Éireann and the NFGWS are working to the same general DWSP approach, which is outlined in EPA Advice Note No. 8 (EPA 2011). The two entities implement their own internal procedures, methods, and practices, as outlined in Section 3.

1.2.6 Source

In the Regulations, the word 'source' is not defined but is interpreted to refer to raw (untreated) water which is abstracted from a borehole/well, spring, infiltration gallery, lake, river, or impoundment, and which is intended for human consumption.

⁶ Per the Regulations, the term 'food business operator' has the meaning given to it in point (3) of Article 3 of Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002.

This use of the term is narrower than in the WFD, where ‘source’ can be either a specified source of water used for water supply purposes or a source of water pollution.

In this guidance, the narrower definition of ‘source’ (as interpreted from the Regulations) applies.

1.2.7 Hazard and Hazardous Event

In the Regulations:

- ▲ A ‘hazard’ is defined as *‘a biological, chemical, physical or radiological agent in water, or another aspect of the condition of water, with the potential to cause harm to human health’*.
- ▲ A ‘hazardous event’ means *‘an event that introduces hazards into, or fails to remove them from, the supply system of water intended for human consumption’*.

Thus, ‘hazards’ are introduced into source waters by ‘hazardous events’.

Regulation 10 requires that hazards and hazardous events be identified by the RA process and that hazardous events be mitigated by RM actions in the DWCs of water intended for human consumption.

In WFD terminology, a hazard is referred to as a pollutant or a contaminant, and a hazardous event is equivalent to a WFD ‘pressure’, i.e. an activity (such as a wastewater discharge or landspreading of slurry) that presents a risk to, or impacts on, water quality.

For the purposes of this guidance, the terminology of the Regulations has been adopted.

1.2.8 Risk Assessment and Risk Management

RA has three component parts (DHLGH 2024):

- ▲ The delineation of DWCs.
- ▲ The evaluation of raw (untreated) source water quality.
- ▲ The ‘characterisation’ of the DWC, which covers the description of physiographic features and identification of environmental pressures within the DWC that may or do give rise to hazards and hazardous events.

RA leads to the identification of hazards and hazardous events which may need to be addressed as part of RM. After the abstraction point, RA places hazards and hazardous events in the context of the treatment being provided, which is not covered in this guidance.

RM comprises strategies and programmes of measures to develop, design, or otherwise specify relevant ‘preventive’ or ‘mitigation’ measures (refer to Section 1.2.9) which are aimed at preventing or controlling risks. RM also involves implementation of measures, which requires planning with prior assessment of feasibility and expected outcomes, as well as coordination and tracking of progress with related activity.

1.2.9 Preventive and Mitigation Measures

The Regulations refers to ‘preventive measures’ and ‘mitigation measures’. Neither term is defined, but as outlined in the ‘National Guidance on Drinking Water Source Protection’ (DHLGH 2024):

- ▲ ‘Preventive measures’ are equivalent to ‘basic measures’ in WFD terminology. These are of a statutory nature, i.e. required by law, such as the Good Agricultural Practices regulations.
- ▲ ‘Mitigation measures’ are like the ‘supplementary measures’ in WFD terminology. These are additional to preventive measures and may be necessary to achieve objectives where preventive measures are deemed insufficient. Mitigation measures are actions that are targeted at localised or specific, identified hazards and hazardous events. They are voluntary, not statutory. An example is a riparian buffer zone.

An overview of preventive measures and resources that are available for the planning and implementation of mitigation measures is provided in Annex 3.

1.2.10 Compliance

The quality of water intended for human consumption must meet parametric values (standards) specified in the Regulations. The main compliance point for drinking water is at the consumer's tap.

Hazards and hazardous events contribute to the risk of non-compliance, but compliance can be assured by provision of adequate treatment. This is, however, not the intent of the Regulations. The intent is to reduce the need for, or to simplify, treatment. Not all hazards can be effectively treated, giving rise to complex and expensive treatment bills. By reducing hazards and risk of hazardous events at source, risk of non-compliance is also reduced.

1.2.11 Catchments of Abstractions

Catchments of abstraction points are the estimated areas that contribute water to abstraction points. These are commonly also referred to as drinking water catchments (DWCs) or, in the case of groundwater, zones of contribution (ZOC). For the purposes of this implementation guidance, the term 'DWC' will be used. Every abstraction point has a DWC. Where a water supply is defined by more than one abstraction point, DWCs may overlap, forming a larger, total DWC.

Depending on whether the water supply abstracts surface water (stream/river or lake) or groundwater (borehole/well or spring), the DWC can be a 'surface water catchment', a 'groundwater catchment', or a combination of the two.

Surface Water Catchments:

Surface water catchments are two-dimensional, and typically basin-shaped areas of land which are bounded by natural features such as hills or mountains from which surface and subsurface water flows into streams, rivers, lakes, and wetlands. The surface water catchment of an abstraction point is the land surface area which contributes surface water to the abstraction point. As such, it is always upstream and at topographically higher elevations than the abstraction point. Thus, some abstraction points on lower order streams can have significantly large DWCs.

Groundwater Catchments:

Groundwater catchments are defined by groundwater flow patterns and connections underground. As such they are three-dimensional, although they are most often presented in two dimensions on maps. Depending on the hydrogeological setting that applies, groundwater catchment boundaries may or may not coincide with topographic boundaries.

The proposed methods for delineation of DWCs are further presented in Annex 4.

1.2.12 Safeguard Zones

The term 'safeguard zone' appears in the WFD (Article 7) as follows: *'Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. Member States may establish safeguard zones for those bodies of water.'*

To date, the term 'safeguard zone' has been applied in Ireland, as follows:

- ▲ S.I. 428 of 2019 (European Communities (Sustainable Use of Pesticides) (Amendment) Regulations 2019) specify 'pesticide safeguard zones' as areas where pesticides must not be used or stored, effectively serving as a type of exclusion zone. Pesticide safeguard zones are listed on the DAFM website: [safeguard zone requirements for defined types of water sources – September 2019.pdf](https://agriculture.gov.ie) (agriculture.gov.ie). Current regulations are subject to further developments at EU level (DHLGH, 2024).
- ▲ 'Safeguard zones' were equated with the 'zone of contribution' to groundwater abstractions (<https://www.catchments.ie/groundwater-source-protection-terminology-used-ireland/>).

For the purposes of this guidance, the term 'safeguard zone' is considered a high-risk area within which targeted mitigation measures are implemented to a) protect the quality of water abstracted for drinking water purposes and b) mitigate (minimise) the need for (additional) raw water treatment. Consistent with the Common Implementation Strategy (CIS) for WFD implementation (EC 2007), safeguard zones are specific to individual pollutants or contaminants, and the zones can be as large or as small as required. Safeguard zones apply to both surface water and groundwater abstractions.

Mitigation measures in safeguard zones may involve exclusion or other management of activity. Safeguard zones become particularly relevant when existing statutory measures (e.g. GAP regulations) and voluntary measures (e.g. through voluntary catchment management initiatives) fail or are proven to be insufficient to meet objectives that have been set.

Other than the safeguard zones which are specified for pesticides by S.I. 428 of 2019, there is currently no legislation or process in place to establish contaminant-specific safeguard zones. Thus, to both establish and enforce measures in safeguard zones, new legislation and implementation guidelines would be required.

Annex 2: Summary of Enforcement Powers Related to Source Water Protection

2.1 Overview

Both EPA and Local Authorities have legal enforcement powers related to drinking water supply under the European Union (Drinking Water) Regulations 2014 (S.I. No. 122/2014). Notices can be served by the EPA on Irish Water and by the Local Authority on non-exempted SPS or private GWS to prepare ‘*action programmes*’ (remedial actions) that will bring supplies up to the necessary drinking water standards as soon as possible. GWS must prepare their action programmes in consultation with the Local Authority.

Enforcement powers for regulation and control of activities within catchments are given by other existing legislation which is presented in Annex 3. Mechanisms for defining and reporting on ‘*action programmes*’ (mitigation measures) in drinking water catchments are offered by WFD-related legislation, including the GAP regulations (S.I. No. 113 of 2022).

The latter states that the Minister of Agriculture ‘*shall prepare and publish not later than 31st December 2025 and every four years thereafter, a programme of measures ... for the protection of waters against pollution from agriculture*’. The EPA is also tasked with undertaking a review of progress made in implementing the GAP regulations ‘*with recommendations as to such additional measures, if any, as appear to be necessary to prevent and reduce water pollution from agricultural sources*’.

By extension, this would include water that is abstracted and intended for human consumption. In the context of safeguard zones, the GAP regulations may provide opportunity for defining and enforcing justifiable measures, including setback distances to abstraction points, based on technical assessment.

Finally, Article 26(11) of the GAP regulations states that ‘*The powers, duties and functions assigned to a local authority or the Agency by this Article are additional to, and not in substitution for, the powers, duties and functions assigned by the Local Government (Water Pollution) Acts 1977 and 1990 or any other statute*’.

The Pesticide Registration and Control Divisions (PRCD) of DAFM is the only stakeholder with enforcement powers for pesticide use and applications. Issues relating to the impact of plant protection products on drinking water supplies (as well as aquatic habitats) are dealt with in EU and national legislation on the sustainable use of pesticides. A legislative proposal from the European Commission for an EU Regulation on the sustainable use of pesticides (SUR), to replace the current Sustainable Use of Pesticides Directive (SUP – Directive 2009/128/EC), was published in June 2022 and is currently being discussed with Member States. The SUR will include measures to protect drinking water supplies that will be legally binding on Member States, such as the establishment of a minimum mandatory buffer zone for all surface water bodies and will also enable Member States to introduce additional measures to protect both the aquatic environment and drinking water supplies.

Since EU regulations are directly applicable in national law, they do not need to be transposed. However, DAFM plans to update existing national legislation to help implement and give further effect to various measures in the SUR, including measures relating to the protection of drinking water supplies and their abstraction points. It is, therefore, important that drinking water source protection measures factor in statutory measures that will be included in new EU and national legislation.

The new national legislation will give the Minister of Agriculture powers to specify measures to protect drinking water supplies, like those included in current national legislation (S.I. 438 of 2019). These include establishing pesticide safeguard zones for any water body, where needed, based on scientific information and analysis. It is worth noting that powers ‘*to increase the protection of water sources used for the abstraction of water for human consumption from pesticide use*’ are already given in S.I. 438 of 2019.

Annex 3: Overview of Preventive Measures and Resources Available for Planning and Implementation of Mitigation Measures

3.1 Statutory Tools for Risk Management

Statutory instruments (laws/regulations) provide the basis for preventive measures and can serve as enforcement tools. Those that are directly relevant to implementation of the Regulations are presented in Table 1.

Table 1: Summary of Relevant Statutory Instruments for Risk Management

EU Directive	Statutory Instrument	Content Relevant to Risk Management
Water Framework Directive (2000/60/EC)	<ul style="list-style-type: none"> ▲ S.I. No. 350 of 2014, European Union (Water Policy) Regulations 2014 ▲ S.I. No. 489 of 2011, European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations 2011 ▲ S.I. No. 366/2016, European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016 ▲ S.I. No. 77 of 2019, European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 	<ul style="list-style-type: none"> ▲ Implementation of WFD, including catchment characterisation, setting environmental objectives, catchment monitoring, need for delineating ‘safeguard zones’ (i.e., protection zones), providing clean and safe water for human consumption. ▲ Establishing programmes of measures in the catchment. ▲ Environmental quality standards (surface water) and groundwater quality standards (groundwater).
Nitrates Directive (91/676/EEC)	<ul style="list-style-type: none"> ▲ S.I. No. 113 of 2022, European Union Good Agricultural Practice for the Protection of Water Regulations 2022 	<ul style="list-style-type: none"> ▲ Landspreading exclusion areas. ▲ Setback distances (e.g. placement of farmyard manure). ▲ Rules for fertiliser applications ▲ Farm surveys.
Sustainable Use of Pesticides Directive (2009/128/EC)	<ul style="list-style-type: none"> ▲ S.I. No. 438 of 2019, European Union Sustainable Use of Pesticides (Amendment) Regulations 2019 	<ul style="list-style-type: none"> ▲ Use of non-selective herbicides; ▲ establishment and enforcement of pesticide safeguard zones; setback distances for karst features; setback distances (other) subject to ‘reasoned argument and supported by scientific evidence’.
	<ul style="list-style-type: none"> ▲ Environmental Protection Agency (EPA) Act 1992 	<ul style="list-style-type: none"> ▲ Discharge licensing. ▲ Enforcement powers. ▲ Public awareness.
	<ul style="list-style-type: none"> ▲ Local Government (Water Pollution) Acts 	<ul style="list-style-type: none"> ▲ Discharge licensing. ▲ Enforcement powers in relation to water pollution incidents. ▲ Septic tanks surveys. ▲ Public awareness/outreach.

EU Directive	Statutory Instrument	Content Relevant to Risk Management
	<ul style="list-style-type: none"> Water Services Acts (2007–2017) 	<ul style="list-style-type: none"> Transfers water services functions from Local Authorities to Irish Water except excluded functions e.g. domestic wastewater treatment systems.
Urban Waste Water Treatment (UWWT) Directive (91/271/EEC)	<ul style="list-style-type: none"> European Union (Waste Water Discharge) Regulations 2007 to 2020; Urban Waste Water Treatment Regulations, S.I. No. 254 of 2001, as amended 	<ul style="list-style-type: none"> Discharge licensing. Establishing Emission Limit Values.
	<ul style="list-style-type: none"> S. I. No. 178 of 2002, General Food Law and the Food Safety Authority of Ireland Act 1998 	<ul style="list-style-type: none"> Definition of food – which includes water intentionally incorporated into food during its manufacture, preparation or treatment. Minimum annual frequencies for sampling and testing for water intended for human consumption or use in food production

For agricultural pressures, the Good Agricultural Practices Regulations is accompanied by Explanatory Handbooks which provide details on cross-compliance requirements or legislation and measures that are required for agricultural pressures. These handbooks are available at:

<https://www.gov.ie/en/publication/52af7-explanatory-handbook-for-cross-compliance-requirements-2016/>

<https://www.gov.ie/en/publication/246da-cross-compliance/>

<https://assets.gov.ie/99046/5312115e-a279-4347-8afc-02d1c466c127.pdf>

3.2 Relevant Non-Statutory Tools for Risk Management

Non-statutory tools, including guidance, in the Irish context are contained in the documents listed and linked below.

- EPA advice notes on topics that relate to drinking water protection, available from: <https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/>
- A LAWPRO/EPA (2022) series of handbooks dedicated to catchment science and management (<https://lawwaters.ie/training/la-csm-course-notes-and-training/>):
 - Volume 1: Overview of Catchment Science and Management
 - Volume 2: Pressures and Catchment Walks
 - Volume 3: Observed Indicator Features and Catchment Walks
 - Volume 4: Measured Indicator Parameters – Catchment Walks
 - Volume 5: Urban Local Catchment Assessments.

NFGWS (2020). A Handbook of Source Protection and Mitigation Actions for Farming. Available at: <https://nfgws.ie/wp-content/uploads/2019/06/Handbook-mitigation-actions-November-2020.pdf>

- ▲ NFGWS (2019). A Framework for Drinking Water Source Protection. Published by the National Federation of Group Water Schemes. Available at: <https://nfgws.ie/nfgws-source-protection-publications>
- ▲ Irish Water (2021). Interim Pesticide Strategy: A collaborative approach with catchment stakeholders. Available at: <https://www.water.ie/projects/strategic-plans/interim-pesticide-strategy/>
- ▲ Waters of Life (2023). Framework of Best Practice Measures and Guidelines for the Protection and Restoration of High Status River Water Bodies (with Annexes). Available at: https://www.watersoflife.ie/app/uploads/2023/08/Measures_Framework.pdf
- ▲ Source to Tap (2022). Various guides for farming, peatland and forestry management for drinking water source protection. Available at: <https://www.sourcetotap.eu/>
- ▲ EPA (2021). Code of Practice. Domestic Waste Water Treatment Systems. (Population Equivalent ≤ 10)
- ▲ DELG/EPA/GSI (1999) – groundwater protection responses, or ‘response matrices’, for different pressure types, as follows:
 - ▲ One-off housing wastewater: https://www.gsi.ie/documents/Groundwater_Response_Matrix_for_one_off_housing_wastewater_treatment.pdf
 - ▲ Land spreading of organic wastes: https://www.gsi.ie/documents/Groundwater_Response_Matrix_for_Landspreading_of_Organic_Waste.pdf
 - ▲ Out-wintering pads: <https://www.gsi.ie/en-ie/publications/Pages/Groundwater-Response-Matrix-for-Out-Wintering-Pads.aspx>
 - ▲ Earth-lined slurry stores/effluent stores: <https://www.gsi.ie/en-ie/publications/Pages/Groundwater-Response-Matrix-for-Earth-Lined-Slurry-Effluent-Stores.aspx>
 - ▲ Landfill siting: https://www.epa.ie/publications/compliance--enforcement/waste/EPA_groundwater_protection_landfills.pdf
- ▲ IFI (2015). Towards sustainably and environmentally sound water management solutions for farms located in close proximity to river catchments: <https://duhallowlife.com/sites/default/files/A2%20Management%20guide%20for%20cattle%20management%20for%20riverine%20SACs.pdf>

This last of these documents provides practical advice on dealing with specific localised issues arising from pressures such as farm roadways, riparian margins, overland flow, and grassland management.

As well, McNally (2017) produced a relevant report entitled ‘Review of potential local measures for mitigating farm impacts in catchments’ which may be available upon request from the EPA’s CSMU.

In the context of karstified bedrock aquifers, the EPA has also published guidance on the ‘Protection of Groundwater from the Landspreading of Organic Wastes’ and ‘Landspreading of Organic Waste: Guidance on Groundwater Vulnerability Assessment of Land’. These are accessible from:

<https://www.epa.ie/publications/compliance--enforcement/waste/protection-of-groundwater-from-the-landspreading-of-organic-wastes.php>

<https://www.epa.ie/publications/compliance--enforcement/waste/landspreading-of-organic-waste-.php>

Annex 4: Delineation of Catchments of Abstractions (Drinking Water Catchments) and Protection Zones

[This annex summarises methods for delineation of drinking water catchments (DWC) and protection zones. It is based on Appendix 2 of the publication 'Drinking Water Source Protection Technical Guidance' prepared by the Department of Housing, Local Government and Heritage (DHLGH 2024) and available at:

<https://www.gov.ie/en/publication/411f4-drinking-water-source-protection/>

Key content is reproduced here for ease of reference.]

4.1 Background

Delineation of catchment areas for abstraction points (drinking water catchments) is required by the Regulations. The delineation is part of the source risk assessment process.

Depending on whether an abstraction is sourced from surface water or groundwater, delineation results in surface water or groundwater catchments. However:

- ▲ There are settings in Ireland where delineation becomes technically more complex, especially in karst regions.
- ▲ There are existing cases in Ireland where additional protection zones (notably safeguard zones) may be justified within DWCs to address raw water quality risk or impact and meet drinking water source protection objectives.
- ▲ More detailed groundwater source protection zones have already been defined in Ireland which serve to guide planning of land uses, such as landspreading of slurry and the siting of landfills.

For these reasons, the Irish context becomes particularly relevant to both catchment delineation and drinking source water protection. Efforts to delineate DWCs have in the past been led by GSI and EPA. Both Uisce Éireann (UÉ) and the National Federation of Group Water Schemes (NFGWS) are continuing to advance this work for their water supplies.

Regarding SPS, these do not generally have delineated DWCs (although there are exceptions). SPS are expected to conduct delineation as part of risk assessment by 12 July 2027. There are currently approximately 1,800 SPS in EPA's national register of abstractions, which is regarded as a fraction of the total number of SPS in existence, most of which remain unregistered.

4.2 Surface Water Catchments

A proposed surface water protection zone approach for rivers and lakes is presented below, which is informed by: a) international literature review, and b) the Irish context of water resources protection.

The approach presented below is provided for guidance purposes. It leaves room for adaptation and amendment. A separate project is needed to strengthen the technical procedures for catchment delineation in context of drinking water source protection.

4.2.1 Streams/Rivers

DWCs for surface water sources tend to be topographically based. For streams and rivers, DWCs incorporate all land areas that contribute water to the stream or river which is being abstracted, upstream of the abstraction point. Within DWCs, high-risk source areas ('critical source areas') may be present that give rise to water quality deterioration and risk(s) to water supplies. By default, such risks are subject to preventive measures through implementation of existing statutory instruments (refer to Annex 3). There are instances, however, when/where spatially targeted non-statutory measures (i.e. mitigation measures) may also be required to remedy confirmed water quality issues at confirmed locations.

- ▲ The implementation of targeted measures would in the first instance be based on voluntary action, involving outreach and stakeholder engagement. However, where such voluntary action fails or proves to be insufficient, safeguard zones could be established based on technical assessment. In the Irish context, mitigation actions in safeguard zones would involve some degree of land use management, and it may be necessary to consider enforcement action if Water Framework Directive and/or drinking water objectives are to be met.
- ▲ Except for 'pesticide safeguard zones' (DHLGH 2024), there is at present no mechanism in place to establish and enforce safeguard zones. New legislation and implementation guidelines would be required to do so.

Regarding existing 'pesticide safeguard zones' that are established under S.I. 428 of 2019, it is not proposed to alter or replace these. However, additional pesticide-related safeguard zones may be needed in the future based on technical assessment and risk assessment of drinking water supplies.

4.2.2 Lakes and Impoundments

The proposed protection zones for lakes and impoundments are presented in **Figure 1**. The DWC will be the lake and its whole topographic catchment, defined in the same manner as for rivers. In karst and certain other specific settings, it is important to consider both surface water and potential groundwater catchments, as groundwater contributing areas can be different and encompass additional areas (to the topographic catchment).

- ▲ Safeguard zones would apply in the same manner as described for rivers.

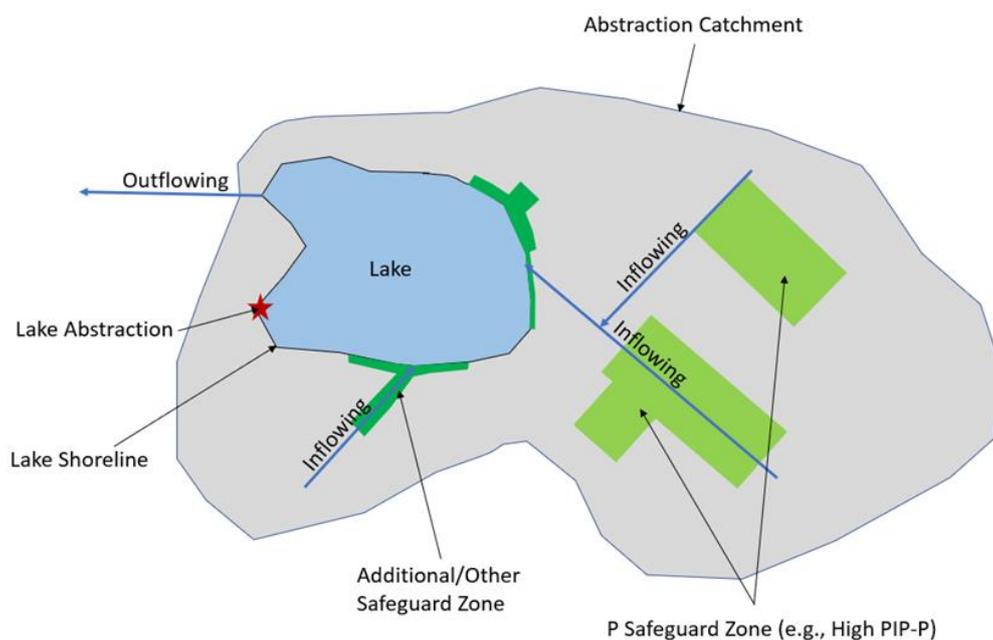


Figure 1: Illustration of the Approach for Setting Protection Zones for Lake Abstractions

For both rivers and lakes, there will be instances where catchments of multiple abstractions overlap, forming 'nested DWCs'. In nested DWCs, the DWC of the most downstream abstraction point would comprise the outermost boundaries of all upstream catchments. However, for purposes of source risk assessment and source risk management, the implementation approach would be to work outwards from the abstraction point in question.

It is also proposed that DWCs and safeguard zones be assigned a confidence level (e.g. High/Low), with annotation of improvements that may be possible based on knowledge gaps or uncertainties. This applies to groundwater protection zones as well.

4.3 Groundwater Catchments

The national groundwater protection schema and methodology developed by GSI (DELG/EPA/GSI 1999) is consistent with the requirements of the Regulations. No changes to current delineation practice are proposed for groundwater sources. The current land area delineation process incorporates:

- ▲ A Zone of Contribution (ZOC), which is equivalent to the groundwater catchment (i.e. the DWC of a groundwater abstraction point).
- ▲ Source Protection Areas (SPAs): The ZOC is broken down into two SPAs:
 - ▲ An Inner Protection Area (SI), designed to give protection from microbial pollution. It is defined by the estimated 100-day time of travel for microbial constituents, from any point below the groundwater table to the abstraction point.
 - ▲ An Outer Protection Area (SO), encompassing the remainder of the ZOC.
- ▲ Source Protection Zones (SPZs): These are obtained by integrating the SPAs with groundwater vulnerability, as shown schematically in Figure 2. The SPZ includes the complete pathway, both vertical and horizontal, for recharge and any entrained contaminants to the abstraction point.

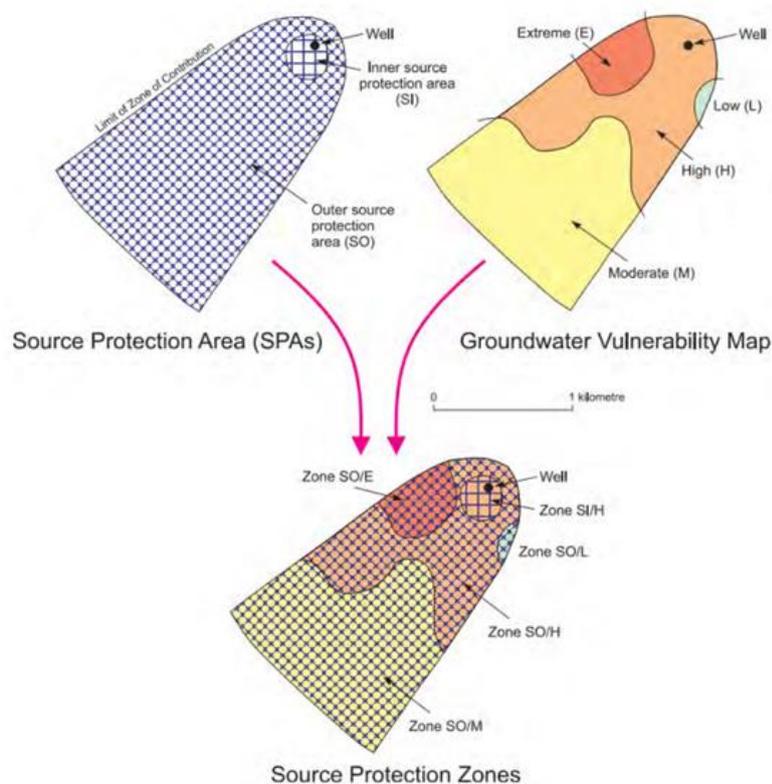


Figure 2: GSI Groundwater Source Protection Zones

Within a ZOC, a pathway may be identified between a feature of interest (e.g. a swallow hole) and an abstraction point which places the abstraction at greater risk of impact. In such cases, separate and contaminant-specific safeguard zones within a ZOC may be established where measures are needed.

In the context of safeguard zones, there is one cautionary note worth highlighting – on setback distances for slurry spreading in the groundwater environment. Specifically, on grazed land in free-draining catchments, setback distances may not be appropriate where nitrate is the pollutant of concern and groundwater is the source of water supply. This is because slurry may not be the main source of leached nitrate on grazed land. Rather, the nitrogen that arises from grazing animals is more prone to leaching than slurry. In such instances, therefore, setback distances for slurry spreading may not prove effective (since it may not be the main source).

In contrast, setback distances for slurry spreading are relevant and particularly appropriate close to surface water bodies in poorly drained catchments and in karst settings where groundwater vulnerability is High or Extreme.

4.4 Conjunctive Use Supplies

Conjunctive use sources are water supplies that incorporate more than one type of abstraction and/or involve both surface and groundwater catchments. A special type of conjunctive use supply in the Irish context is an infiltration gallery. This is generally a linear water collection system constructed below the groundwater level, involving slotted pipe and one or more collection chambers. Infiltration galleries lower groundwater levels locally, thereby inducing groundwater flow into the pipe, from both directions. Where they are constructed close to rivers or lakes, they may induce flow from the surface water body, via subsurface pathways (by gravity flow). The hydraulic capture of river or lake water depends mainly on the stage (level) relationship between groundwater and surface water, but also the hydraulic conductivity of the geological media (e.g. subsoils, bedrock). In Ireland, infiltration galleries are usually constructed in alluvial sediments (sands and gravels) alongside river channels. In this scenario, the infiltration gallery intercepts groundwater flow to the river and water flow which is induced back from the river. Consequently, most infiltration galleries would have both a groundwater catchment and a surface water catchment. The groundwater catchment may also have both an 'SI' and an 'SO' defined.

Boreholes (or sometimes pumped springs) adjacent to rivers/ lakes can similarly induce river flow, and the foregoing will also apply in such cases. Accordingly, the catchment delineation of conjunctive use sources must consider both groundwater and surface water catchments, as appropriate.

4.5 Water Supplies Involving Karst

In karst settings, groundwater and surface water are hydraulically connected and most often part of the same flow system. Thus, a river or lake that is pumped may have a groundwater catchment in addition to a surface water catchment. Similarly, a borehole that is pumped in a karstified bedrock aquifer may induce flow from a nearby stream or lake, which should be factored in the risk assessment process. Specialised groundwater expertise and good conceptual models are necessary to conduct risk assessments of abstractions in karst settings.

4.6 Small Private Supplies

Delineation of DWCs for SPS is the responsibility of the SPS owner who may need to arrange to have the delineation done. Most SPS abstract groundwater from wells and springs. Simple delineation methods are proposed based on GSI's desk-based water balance method, which is governed by the following simple equation:

$$\text{Abstraction (m}^3\text{/day)} = \text{Recharge (m/day)} \times \text{Area (m}^2\text{)}$$

In this method, abstraction and recharge rates are used to define an area which is required to sustain the abstraction. The area reflects the size of the ZOC but the shape of the ZOC must be adjusted to account for the likely groundwater flow field, guided by topography.

GSI has developed a preliminary delineation tool which applies this method. It is proposed that this tool be adapted, tailored, and made publicly available through a GSI website (DHLGH 2024). For the delineation, any SPS owner is likely going to need assistance from GSI or an agent (a suitably qualified hydrogeologist) since the delineation method involves hydrogeological judgement.

In a scenario where local authorities conduct RAs directly (in lieu of SPS owners), local authorities may approach GSI for assistance with delineation.



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