

****Please note – this report must be read in conjunction with the Northern Ireland Water Framework Directive Summary Report of the characterisation and impact analyses required by Article 5****
(<http://www.ehsni.gov.uk/pubs/publications/article5report.pdf>)

Groundwater Risk Assessment Summary

1. Methodology

As outlined in the Water Framework Directive (WFD), a groundwater body could be considered to be at risk of not attaining 'good status' because of:

- failure of dependent surface water bodies to achieve environmental objectives;
- significant damage to dependent terrestrial ecosystems;
- significant and sustained upward trends in the concentration of pollutants;
- salt water or other intrusions of poor quality water;
- failure to meet protected area objectives (e.g. for Drinking Water Protected Areas)

The above environmental objectives for groundwater clearly emphasise the importance placed by the WFD on the relationship between groundwater and dependent surface water receptors and ecosystems. Hence, in addition to delineating and undertaking an assessment of the whole groundwater body as regards general water quality and resource availability, associated dependent surface water receptors and ecosystems need to be identified and local risks determined.

Risks to groundwater bodies and associated surface waters and ecosystems were assessed for:

- Diffuse pollution
- Point source pollution
- Urban pollution
- Saline intrusion
- Abstraction impacts

The overall risk classification assigned to a groundwater body represents the highest risk class arising from any of the assessments undertaken for the body. Relevant groundwater monitoring data have been used to confirm/adjust predictive assessments where appropriate¹.

2. Pressure and Impact Risk Assessment

The groundwater bodies delineated, and the dependent surface water bodies and ecosystems identified, represent receptors that can be impacted by anthropogenic pressures, both quantitative and chemical.

¹ Further background to risk assessment principles and procedures can be found at:
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG2003 WP 7h %2801%29/view
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG2003 WP 7i %2802%29/view

Quantitative Risk Assessment

Analysis of the requirements of the WFD have indicated that, in summary, the following assessments are needed to determine the risk of failing to achieve good quantitative status:

- What is the overall water balance for the groundwater body (i.e. is the level of water abstraction such that it can be met by the amount of water entering the groundwater body (recharge) without impacting on the water requirements of dependent waters, such as rivers and lakes?)
- Are any individual abstractions or groups of abstractions impacting on sensitive ecosystems such as river headwaters or Groundwater Dependent Terrestrial Ecosystems (GWDTEs) due to local lowering of water levels? and
- Is abstraction causing alterations to natural flow directions such that saline or other intrusions are resulting?

The above assessments were carried out for each groundwater body and significant dependent surface water and/or terrestrial ecosystems².

Chemical Risk Assessment

General groundwater quality can be influenced by a wide variety of activities occurring on or below the land surface. Such activities can include common practices such as agricultural land use and the associated application of fertilisers and pesticides (diffuse source) as well as 'accidental' incidents such as leakage from hydrocarbon storage tanks (point source). These activities represent potential pressures on water quality within underlying groundwater bodies.

The impact, if any, from such pressures will be significantly influenced by both the pathway through which the pollutant must travel and the sensitivity of the receptor at risk. For groundwater, soils and sub-soils overlying the groundwater body can exert a strong influence on whether pollutants reach groundwater. However the nature of the aquifer forming the groundwater body will also be an influence in certain cases. The concept of *pathway susceptibility* has been developed by UK and Ireland groundwater experts to reflect the characteristics of the pathway from the pressure to the receptor. For example, in considering the risk from a point source pollution to a nearby wetland, the nature of the soils, subsoils, groundwater flow within the aquifer and the hydraulic connection between groundwater and the wetland could all be elements of the pathway susceptibility³.

a) Diffuse Assessment

The following diffuse pollutant types were considered in the risk assessment of impact on groundwater bodies and associated ecosystems:

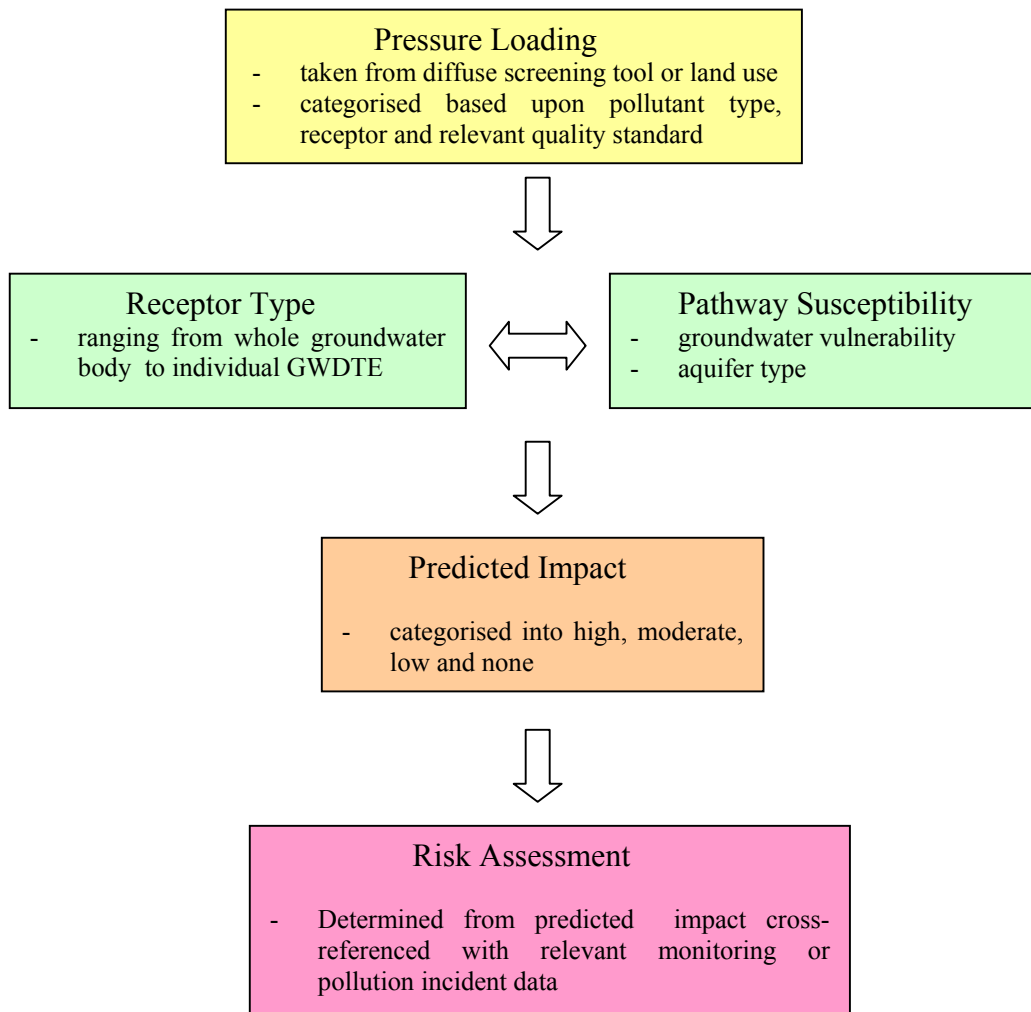
² Further details on the requirements for quantitative risk assessment can be found at:
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG2003 WP 7h %2801%29/view

³ Further guidance on the risk assessment process can be found at:
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG2003 WP 7i %2802%29/view

- Nitrates
- Phosphorus
- Selected pesticides
- Urban land use

The key elements of the risk assessment are summarised in the diagram below.

The assessment area across which the analysis was undertaken ranged from the whole groundwater body surface area to individual river body and lake catchments, depending upon the receptor type.



The approach taken to diffuse risk assessment has followed, for the most part, that developed by the Scottish Environmental Protection Agency (SEPA) (SEPA, 2004), which built upon guidance previously developed by the UK WFD Groundwater Task Team.

b) Point Sources Assessment

For the purposes of initial characterisation, available datasets were examined to identify activities or specific land uses that could represent point source pressures to groundwater, such as sheep dip disposal or landfill. For most potential point sources, some form of regulatory control already exists, and so the threat from them is limited. The presence of a potential point source of pollution within the relevant assessment area was the main criterion used when considering the risk posed. Limitations in the datasets restricted the detail of assessments undertaken and influenced the final risk categories assigned.

3. Overall Risk Assessment

The hydrogeological understanding of significant areas of Northern Ireland is limited. While the basic characteristics of different geological formations can be inferred from available data and from knowledge of similar strata elsewhere, a more systematic assessment of individual hydrogeological settings is considered necessary. Following more detailed assessment, in future, groundwater body boundary modifications may be required. Identification and characterisation of GWDTE's has been undertaken at a relatively coarse level because of data limitations and further consideration of these complex settings is intended.

Risk assessment categories may also change as assessments are completed for cross-border groundwater bodies and as more detailed datasets and information become available as part of the further characterisation process.

4. Data Gaps and Future Work

Data sets for point sources and abstractions could be improved to increase confidence in assessments. Certain pollutant loadings (e.g. from septic tanks) could not be considered because of data gaps. However it is considered that the most significant pressures on groundwater have been identified and assessed. As more detailed geological data layers and other data sets become available, improvements to assessments will be possible. In some instances, an 'at risk' category has been assigned because of an impact identified for only a small proportion of the overall body. When considered in more detail as part of further characterisation, some risk categories may be downgraded.

5. North South Perspective

The method for delineating groundwater bodies, based on hydrogeological considerations, means that in border areas some groundwater bodies extend into Ireland. For those cross-border bodies, consideration has also been given to risk assessment results available for the portion of the body falling within Ireland.

References

SEPA, 2004. Environmental Characterisation of Scotland's water environment. Supporting information for groundwaters. Authors: Fitzsimons, V., Clews, C & Simpson, E.