

# The Delineation and Characterisation of Groundwater Bodies to Meet the Requirements of the EU Water Framework Directive

Phase 1: Initial Interpretation and Outline Procedures  
R&D Technical Summary P2-260/6/TS/1

In December 2000 the European Union introduced the Water Framework Directive 2000/60/EC – "establishing a framework for Community action in the field of water policy". The Directive was in response to a widespread consensus that water policy across the European Union was fragmented, both in terms of overall objectives and specific requirements, and is the most significant piece of new European water legislation for over 20 years.

Article 5 of the WFD requires that Member States undertake an analysis of the characteristics of each River Basin District and review the impact of human activity on the status of groundwater. A major element of the characterisation of groundwater is the mapping and description of "groundwater bodies". Characterisation is sub-divided into two stages – **initial characterisation** and **further characterisation**, where further characterisation is required for groundwater bodies deemed to be "at risk" of failing to meet specified environmental objectives, principally the objective of reaching good status by 2015.

The purpose of this report is to present a methodology for the delineation and characterisation of groundwater bodies to enable this aspect of the requirements of the WFD to be fulfilled. In order to develop the methodology it has been necessary initially to interpret the Directive's requirements - often to a significant extent. The guiding principles thus established were then used to formulate a methodology for delineation and characterisation. The approach has been generally precautionary, in that, where decisions have to be made on whether a groundwater body is at risk of failing to meet the environmental objectives by 2015 using inadequate data, the least optimistic outcome is assumed, unless there is a high level of confidence that this is not the case.

Where a groundwater body is "at risk" further analysis of the existing data may be undertaken in order to attempt to understand the hydrological system better. It is recognised that decisions have to be pragmatic, given the short timescale of characterisation, the limited understanding of aspects of the hydrogeology, constraints on resources and likely paucity of data in many areas. It is assumed that only existing data (as of the end of 2002) will be used to meet the December 2004 deadline, but that further data collection and analysis will proceed subsequently, targeted at refining the risk assessment and the development of the programme of measures.

Two principal conclusions were reached

- given that the definition of an aquifer in WFD terms is essentially based on abstraction and flow criteria, and that the lower abstraction limit is small, most geological materials in the UK are likely to be classified as aquifers in WFD terms.
- the main guiding principle for the delineation of groundwater bodies is that flowlines in an aquifer should not cross from one groundwater body to another. This is to enable groundwater bodies to be treated as coherent hydraulic systems (to aid determination of quantitative status) and to be managed as such.

The following main conclusions were reached concerning characterisation principles:

1. The effect of pollution pressures at the ground surface may not be transmitted directly to an underlying groundwater body; therefore the term "potential impact" has been introduced to describe the likely effects of the pressure on the groundwater body.
2. The assessment of whether a groundwater body is at risk of failing Article 4 objectives involves the assessment of its current condition and then an assessment of the likelihood of the body failing to be of "good status" by 2015.
3. Although not an explicit requirement of the Directive, the use of conceptual models of groundwater bodies will be fundamental to their effective characterisation.

Based on the requirements of the Directive and their interpretation, a methodology has been developed for the delineation and characterisation of groundwater bodies and is presented in the report. The main features of the methodology for delineation are as follows:

- The methodology is iterative. Thus, for example, only simple conceptual models are required at first in order to delineate the groundwater bodies, becoming, where required, more sophisticated (and expensive) as the characterisation process proceeds. Iteration also allows for the refining of boundaries or the subdivision or aggregation of groundwater bodies.
- The process is hierarchical. Thus, for example, in large aquifers large-scale flow systems are initially identified and may be subsequently subdivided as necessary into appropriately sized management units.
- Data for characterisation are collated on a "characterisation area" basis. This is likely to use CAMS areas (catchments) in England and Wales.
- Groundwater systems in aquifers should be subdivided or aggregated to form groundwater bodies of a suitable size for management (generally at least tens of square kilometres in area), which will reflect the pressures and impacts on groundwater.
- Groundwater body boundaries should generally be chosen initially on the basis of geology, using WFD aquifer boundaries. If necessary, subsequent subdivision is performed using groundwater divides and finally using flowlines.
- The groundwater body as delineated will remain constant during a River Basin Management Plan, but may be subdivided or amalgamated with adjacent bodies in subsequent RBMP cycles, dependent on management needs.

The methodology is not yet complete and requires further work before it can be properly implemented. In addition to the need for a mechanism for evaluating pressures and for a countrywide vulnerability methodology, other important requirements include a methodology for obtaining surface water body and terrestrial ecosystem groundwater needs and clarification of the process of determining chemical status for groundwater bodies.

The procedures detailed in P2-260/TR/1 will be piloted in a number of selected catchments in Phase 2 of the project (P2-260/6 Phase 2), allowing further development leading to a detailed methodology which will be published on delineation and characterisation of groundwater bodies.

This R&D Technical Summary relates to information from R&D Project P2-260/6 reported in detail in the following output:-

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