Fracturing and the Hydrogeology of the Permo-Triassic Sandstones in England and Wales

The Permo-Triassic Sandstones are one of the major aquifers in England and Wales. Despite this, the role of secondary permeability in their hydrogeological behaviour is not well known. This project was designed to undertake a preliminary study of the subject to enable a more comprehensive programme to be planned if this were deemed advisable. However the present study has collated much information and ideas from a variety of sources and forms a comprehensive treatise in its own right. Additionally the project team was able to include data from North West region by virtue of being given early access to various reports from UK NIREX LTD. This has enabled a more complete picture of the problem to be drawn and gives added value to the project outputs.

The study provides an overview of the current concepts of fracturing in sandstones and their implications for groundwater flow, and reviews existing hydrogeological data on fractures in the Permo-Triassic sandstone in a systematic manner. The report describes the generic characteristics of fracturing in sandstones, and the hydraulic and hydrogeological behaviour of fractures in porous sandstones. It identifies and evaluates appropriate techniques for improving our understanding of the geometry and hydraulic behaviour of the fractures, and collates and evaluates what information there is on the geometry and distribution of the fracture systems in the Permo-Triassic sandstone aquifer in England and Wales, and describes their affects on local and regional hydrogeology. It is concluded with a description of the principal geological and hydrogeological uncertainties associated with fracturing in the Permo-Triassic sandstone aquifer in England and Wales

The two types of fracture that are most hydrogeologically significant are bedding plane features and faults. Bedding plane fractures are common in the aquifer in all areas of the country. They may develop along any mechanically weak bedding plane surface, but they appear to be preferentially developed at relatively shallow depths and at discrete lithological contacts such as shale-sandstone boundaries.

The text is divided into sections on fracture characterisation, on the fracture controlled hydraulic properties, and on conceptual models of fracture flow. This is backed up by appendices giving the theoretical information on fracture flow, and by tables of likely characteristics and fracture distributions

Although there is a need to improve the general understanding of the nature and distribution of bedding plane features, there is a specific need to be able to understand why some are more hydraulically significant than others and how these significant fractures correlate with depth or lithology.

Likely avenues for further work are the investigation of the likely extent of bedding plane fractures particularly as potential routes for the rapid transport of polluted groundwater and the investigation of the hydraulic characteristics of faults and in particular, whether they act as barriers or as areas of increased permeability.

This R&D technical summary relates to information from Project W6-004 in the following output:

R&D Technical Report W164: 'Fracturing and the Hydrogeology of the Permo-Triassic Sandstones in England and Wales'

Internal Status:	Release to Regions
External Status	Unrestricted
Project Manager:	Steve Fletcher
Research Contractor:	British Geological Survey

Copies of R&D Technical Report W164 are available internally from the Regional Libraries/Management Support Officers and externally from WRc plc (Tel: 01793 865012; Fax 01793 514562).

Rio House
Waterside Drive
Aztec West
Almondsbury
Bristol
BS32 4UD

Tel: 01454 624400
Fax: 01454 624409

Fracturing and the Hydrogeology of the Permo-Triassic Sandstones in England and Wales

ENVIRONMENT AGENCY

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