

Preface

This book is an outgrowth of an investigation of the state of the art in aquifer characterization techniques. The focus is on what is possible and practical from an applied perspective. The word ‘practical’ is stressed in that the aquifer characterization and modeling approaches selected for a given project must be accommodated by project budgets and time frames. Leading-edge technologies developed in academia and government research laboratories are often not viable for applied projects, such as the assessment of a contaminated site, design of a managed aquifer recharge system, or impact assessment of proposed wellfield, because of their time requirements, costs, or the local unavailability of required specialized equipment and expertise. In the applied realm, the overriding objective is cost-effective solutions not technical wizardry. However, technologies are transferred into the applied realm to the extent that they are demonstrated to provide value by, for example, providing higher-quality data at a competitive cost to other more conventional options. For example, advanced borehole geophysical logs (e.g., nuclear magnetic resonance) developed for the oil and gas industry are relatively expensive to run, but can be justified for projects in which data are needed on fine-scale aquifer heterogeneity because they can provide detailed data on porosity and permeability at often a lesser cost than a coring program.

The objective is to have full toolbox of technologies available from which aquifer characterization tools are selected as appropriate for a given project. It is, therefore, incumbent on groundwater professionals to be familiar with all the available aquifer characterization tools, the types of information they provide, and their underlying assumptions and limitations. The goal of this book is to provide an overview of aquifer characterization techniques, focusing on aquifers in sediments and sedimentary rock. A brief primer on aquifer types, hydraulics, and heterogeneity is first provided. Next are chapters on the sedimentology and diagenesis of siliciclastic and carbonate aquifers, focusing on how they related to aquifer heterogeneity. The greatest part of the part of the book is a review of aquifer characterization technologies that are appropriate and have been used for the characterization of sedimentary aquifers. Finally, methods are presented as to how

the various data can be analyzed, processed, and incorporated into groundwater flow and solute-transport models.

In light of the enormous groundwater literature, any book on aquifer characterization must necessarily be cursory. Indeed, entire dedicated books have been written on the subjects of some chapters. Numerous references are, therefore, provided to key publications to allow the reader to further investigate each topic. It is important to recognize that some aquifer characterization techniques require a high level of technical expertise to properly perform and process the data, which necessitates inclusion of specialists in project teams. Practical experience can be invaluable towards insuring project success.

A state-of-the-art review is necessarily a snapshot of the technologies and methods available at one point in time. It is expected that with continued rapid development in the field, many new techniques will be developed and enter the applied hydrogeology realm.

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