

Applied Hydrogeology of Fractured Rocks

B.B.S. Singhal and
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John M. Sharp



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Applied Hydrogeology of Fractured Rocks B.B.S. Singhal †, R.P. Gupta, 2013-11-11 Hydrology is a topical and growing subject as the earth's water resources become scarcer and more vulnerable. Although more than half the surface area of continents is covered with hard fractured rocks, there has until now been no single book available dealing specifically with fractured rock hydrogeology. This book deals comprehensively with the fundamental principles for understanding these rocks as well as with exploration techniques and assessment. It also provides in depth discussion of structural mapping, remote sensing, geophysical exploration, GIS, field hydraulic testing, groundwater quality and contamination, geothermal reservoirs and resources assessment and management. Hydrogeological aspects of various lithology groups including crystalline rocks, volcanic rocks, carbonate rocks and clastic formations are dealt with separately using and discussing examples from all over the world. *Applied Hydrogeology of Fractured Rocks* will be an invaluable reference source for postgraduate students, researchers, exploration scientists and engineers engaged in the field of groundwater development in fractured rock areas.

Applied Hydrogeology of Fractured Rocks B. B. S. Singhal, R. P. Gupta, 1999 Hydrology is a topical and growing subject as the earth's water resources become scarcer and more vulnerable. Although more than half the surface area of continents is covered with hard fractured rocks, there has until now been no single book available dealing specifically with fractured rock hydrogeology. This book deals comprehensively with the fundamental principles for understanding these rocks as well as with exploration techniques and assessment. It also provides in depth discussion of structural mapping, remote sensing, geophysical exploration, GIS, field hydraulic testing, groundwater quality and contamination, geothermal reservoirs and resources assessment and management. Hydrogeological aspects of various lithology groups including crystalline rocks, volcanic rocks, carbonate rocks and clastic formations are dealt with separately using and discussing examples from all over the world. *Applied Hydrogeology of Fractured Rocks* will be an invaluable reference source for postgraduate students, researchers, exploration scientists and engineers engaged in the field of groundwater development in fractured rock areas.

Applied Hydrogeology of Fractured Rocks B. B. S. Singhal, R. P. Gupta, 2014-01-15 *Groundwater in Fractured Rocks* Jirí Krásný, John M. Sharp, 2007-07-05 The hydrogeologic environment of fractured rocks represents vital natural systems, examples of which occur on every continent. This book discusses key issues, methodologies and techniques in the hydrogeology of fractured rocks, summarizing recent progress and anticipating the outcome of future investigations. Forty-four revised and updated papers with *Fractured Rock Hydrogeology* John M. Sharp, 2014-06-05 Fractured rocks extend over much of the world, cropping out in shields, massifs and the cores of major mountain ranges. They also form the basement below younger sedimentary rocks. At depth, they represent a continuous environment of extended and deep regional groundwater flow. Understanding of groundwater flow and solute transport in fractured rocks is vital for analysis of water resources, water quality and environmental protection, geotechnical and engineering projects and geothermal energy.

production Book chapters include theoretical and practical analyses using numerical modelling geochemistry isotopes aquifer tests laboratory tests field mapping geophysics geological analyses and some unique combinations of these types of investigation Current water resource and geotechnical problems in many countries and the techniques now used to address them are also discussed The importance of geological interpretation is re emphasised in analysing the hydrogeology of fractured mostly crystalline rocks and in how critical this is for understanding their hydrology and the wise utilisation of resources This is indeed hydrogeology in its broadest sense The importance of but great difficulty in extending or upscaling fractured rock hydraulic properties is also made clear This book is aimed at practicing hydrogeologists engineers ecologists resource managers and perhaps most importantly students and earth scientists not yet familiar with the ubiquity and importance of fractured rock systems

Applied Hydrogeology for Scientists and Engineers Zekai Sen, 2017-12-14 In order to properly plan design and operate groundwater resources projects it is necessary to measure over time or distance pertinent groundwater variables such as drawdown and discharge in the field Applied Hydrogeology for Scientists and Engineers shows how to assess and interpret these data by subsurface geological setup and processing The book helps readers estimate relevant groundwater parameters such as storativity transmissivity and leakage coefficient The text addresses many interrelated disciplines such as geology hydrology hydrogeology engineering petroleum geology and water engineering Traditional and current models for application are presented One of the unique features of the book is the inclusion of new and previously unpublished ideas concepts techniques approaches and procedures developed by the author Among these are hydrogeophysical concepts slope matching techniques volumetric approach solution for complicated groundwater flows non Darcian flow law applications aquifer sample functions dimensionless type straight line methods non linear flow type curves discharge calculations from early time drawdown data storage coefficient estimation procedure for quasi steady state flow and much more The pitfalls in aquifer test analysis are also detailed Fractured medium flow adds yet another dimension to the book Each method is supplemented by actual field data applications from worldwide case studies Applied Hydrogeology for Scientists and Engineers covers the topics of groundwater reservoirs the evaluation of aquifer parameters aquifer and flow properties flow properties and bore hole tests aquifer tests in porous and fractured media well hydraulics groundwater flow and aquifer tests and field measurements and their interpretations This new reference also works well as a post graduate textbook on the subject Applied Hydrogeology for Scientists and Engineers expands the reader's knowledge by providing valuable information not found in any other publication

Groundwater in Fractured Rocks John M. Sharp, 2007-07-05 The hydrogeologic environment of fractured rocks represents vital natural systems examples of which occur on every continent This book discusses key issues methodologies and techniques in the hydrogeology of fractured rocks summarizing recent progress and anticipating the outcome of future investigations Forty four revised and updated papers w

Characterization, Modeling, Monitoring, and Remediation of Fractured Rock National

Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, Board on Earth Sciences and Resources, Committee on Geological and Geotechnical Engineering, Committee on Subsurface Characterization, Modeling, Monitoring, and Remediation of Fractured Rock, 2021-01-29 Fractured rock is the host or foundation for innumerable engineered structures related to energy water waste and transportation Characterizing modeling and monitoring fractured rock sites is critical to the functioning of those infrastructure as well as to optimizing resource recovery and contaminant management Characterization Modeling Monitoring and Remediation of Fractured Rock examines the state of practice and state of art in the characterization of fractured rock and the chemical and biological processes related to subsurface contaminant fate and transport This report examines new developments knowledge and approaches to engineering at fractured rock sites since the publication of the 1996 National Research Council report Rock Fractures and Fluid Flow Contemporary Understanding and Fluid Flow Fundamental understanding of the physical nature of fractured rock has changed little since 1996 but many new characterization tools have been developed and there is now greater appreciation for the importance of chemical and biological processes that can occur in the fractured rock environment The findings of Characterization Modeling Monitoring and Remediation of Fractured Rock can be applied to all types of engineered infrastructure but especially to engineered repositories for buried or stored waste and to fractured rock sites that have been contaminated as a result of past disposal or other practices The recommendations of this report are intended to help the practitioner researcher and decision maker take a more interdisciplinary approach to engineering in the fractured rock environment This report describes how existing tools some only recently developed can be used to increase the accuracy and reliability of engineering design and management given the interacting forces of nature With an interdisciplinary approach it is possible to conceptualize and model the fractured rock environment with acceptable levels of uncertainty and reliability and to design systems that maximize remediation and long term performance Better scientific understanding could inform regulations policies and implementation guidelines related to infrastructure development and operations The recommendations for research and applications to enhance practice of this book make it a valuable resource for students and practitioners in this field

Rock Fractures in Geological Processes Agust Gudmundsson, 2011-04-28 Rock fractures control many of Earth's dynamic processes including plate boundary development tectonic earthquakes volcanic eruptions and fluid transport in the crust An understanding of rock fractures is also essential for effective exploitation of natural resources such as ground water geothermal water and petroleum This book combines results from fracture mechanics materials science rock mechanics structural geology hydrogeology and fluid mechanics to explore and explain fracture processes and fluid transport in the crust Basic concepts are developed from first principles and illustrated with worked examples linking models of geological processes to real field observations and measurements Many additional examples and exercises are provided online allowing readers to practise formulating and quantitative testing of models Rock Fractures in

Geological Processes is designed for courses at the advanced undergraduate and graduate level but also forms a vital resource for researchers and industry professionals concerned with fractures and fluid transport in the Earth's crust

Groundwater in Fractured Bedrock Environments: Managing Catchment and Subsurface Resources U. Ofterdinger, A. M. MacDonald, J.-C. Comte, M. E. Young, 2019-07-19 Fractured bedrock aquifers have traditionally been regarded as low productivity aquifers with only limited relevance to regional groundwater resources. It is now being increasingly recognised that these complex bedrock aquifers can play an important role in catchment management and subsurface energy systems. At shallow to intermediate depth fractured bedrock aquifers help to sustain surface water baseflows and groundwater dependent ecosystems provide local groundwater supplies and impact on contaminant transfers on a catchment scale. At greater depths understanding the properties and groundwater flow regimes of these complex aquifers can be crucial for the successful installation of subsurface energy and storage systems such as deep geothermal or Aquifer Thermal Energy Storage systems and natural gas or CO₂ storage facilities as well as the exploration of natural resources such as conventional/unconventional oil and gas. In many scenarios a robust understanding of fractured bedrock aquifers is required to assess the nature and extent of connectivity between such engineered subsurface systems at depth and overlying receptors in the shallow subsurface.

Groundwater M. Thangarajan, 2007-06-10 The demand for water resources is increasing day by day due to ever increasing population mostly from developing countries. This has resulted in abstracting more water from the subsurface stratum and forcing the water managers to manage the limited groundwater resources in a more scientific way which in turn needs a more sophisticated way of assessing the underground resource and manage it optimally. There is an urgent need to locate high yielding boreholes in the hard rock region by using geophysical methods. Electrical imaging technique in conjunction with remote sensing and geographical information system GIS technique has proved to be a potential tool for the purpose. Hydrodynamics of fractured aquifer system in hard rock region is not yet fully understood. The understanding of the groundwater pollution migration in porous and fractured aquifer system and the seawater intrusion in the coastal aquifer has to be improved further. Various aspects of groundwater modeling and in particular issues related to model calibration validation and prediction has to be understood in much better way. One should integrate all the above issues for effective understanding of the assessment and management of groundwater resources. There is a need to have a comprehensive book to deal with all the above. My former colleague Dr M Thangarajan Retired Scientist G NGRI Hyderabad India has successfully edited a book on GROUNDWATER Resource Evaluation Augmentation Contamination Restoration Modeling and Management by inviting topics from various experts across the globe.

Groundwater Dynamics in Hard Rock Aquifers Shakeel Ahmed, Ramaswamy Jayakumar, Abdin Salih, 2008-11-18 This book contains the results and findings of the advanced research carried out in a pilot area with a thorough investigation of the structure and functioning of an aquifer in a granitic formation. It characterizes the hard rock aquifer system and examines its

properties and behavior as well as systematically details the geophysical geological and remote sensing applications to conceptualize such an aquifer system Aquifer Characterization Techniques Robert G. Maliva, 2016-05-26 This book presents an overview of techniques that are available to characterize sedimentary aquifers Groundwater flow and solute transport are strongly affected by aquifer heterogeneity Improved aquifer characterization can allow for a better conceptual understanding of aquifer systems which can lead to more accurate groundwater models and successful water management solutions such as contaminant remediation and managed aquifer recharge systems This book has an applied perspective in that it considers the practicality of techniques for actual groundwater management and development projects in terms of costs technical resources and expertise required and investigation time A discussion of the geological causes types and scales of aquifer heterogeneity is first provided Aquifer characterization methods are then discussed followed by chapters on data upscaling groundwater modelling and geostatistics This book is a must for every practitioner graduate student or researcher dealing with aquifer characterization Water Wells and Boreholes Bruce Misstear, David Banks, Lewis Clark, 2007-01-11 Water Wells and Boreholes provides the necessary scientific background together with practical advice using global case studies in an accessible easy to use style suitable for both postgraduates researchers and practitioners The book begins with an introduction to the type and uses of water wells from water supply and irrigation through to groundwater remediation It then covers well siting detailing how to source data from geophysical surveys remote sensing etc Well design is then summarised to ensure the well is stable and cost effective The book ends with three chapters covering well construction well testing and well performance maintenance and rehabilitation **Developments in Hydraulic Conductivity Research** Oagile Dikinya, 2011-02-28 This book provides the state of the art of the investigation and the in depth analysis of hydraulic conductivity from the theoretical to semi empirical models perspective as well as policy development associated with management of land resources emanating from drainage problem soils A group of international experts contributed to the development of this book It is envisaged that this thought provoking book will excite and appeal to academics engineers researchers and University students who seek to explore the breadth and in depth knowledge about hydraulic conductivity Investigation into hydraulic conductivity is important to the understanding of the movement of solutes and water in the terrestrial environment Transport of these fluids has various implications on the ecology and quality of environment and subsequently sustenance of livelihoods of the increasing world population In particular water flow in the vadose zone is of fundamental importance to geoscientists soil scientists hydrogeologists and hydrologists and allied professionals *Applied Ground-water Hydrology and Well Hydraulics* Michael Kasenow, 2001 *Practical Handbook of Soil, Vadose Zone, and Ground-Water Contamination* J. Russell Boulding, Jon S. Ginn, 2016-04-19 A synthesis of years of interdisciplinary research and practice the second edition of this bestseller continues to serve as a primary resource for information on the assessment remediation and control of contamination on and below the ground surface Practical Handbook of Soil Vadose Zone and

Ground Water Contamination Assessment Prev

**Engineering Geology of Groundwater in Design and Construction:
Engineering Group Working Party Report** I.J. Duncan ,U.L. Lawrence,2025-09-16

The majority of ground engineering projects encounter water in one way or another Delays and unforeseen costs inevitably follow when that encounter is unexpected and the impacts can affect a surprisingly large area To understand and manage the risks associated with groundwater expertise is required in the areas of hydrogeology hydrology engineering geology land quality risk management communication and planning In view of the wider context that groundwater plays in support of our society economy and environment this Engineering Group Special Publication has been produced offering best practice guidance and providing a general overview of groundwater in engineering geology including modelling risks and management This book provides a state of the art review and guidance for the management of risks associated with groundwater during design and construction of engineering projects Engineering Geology of Groundwater in Design and Construction is intended to be practical informative and to be of use to a wide spectrum of readers from a diversity of backgrounds and employments

Hydraulic Conductivity Lakshmanan Elango,2011-11-23 There are several books on broad aspects of hydrogeology groundwater hydrology and geohydrology which do not discuss in detail on the intrigues of hydraulic conductivity elaborately However this book on Hydraulic Conductivity presents comprehensive reviews of new measurements and numerical techniques for estimating hydraulic conductivity This is achieved by the chapters written by various experts in this field of research into a number of clustered themes covering different aspects of hydraulic conductivity The sections in the book are Hydraulic conductivity and its importance Hydraulic conductivity and plant systems Determination by mathematical and laboratory methods Determination by field techniques and Modelling and hydraulic conductivity Each of these sections of the book includes chapters highlighting the salient aspects and most of these chapters explain the facts with the help of some case studies Thus this book has a good mix of chapters dealing with various and vital aspects of hydraulic conductivity from various authors of different countries

Fractures, Fluid Flow and Mineralization Ken McCaffrey,Lidia Lonergan,Jamie Wilkinson,1999 Hydrothermal mineralization is usually structurally controlled so it is important to understand the role of faulting and fracturing in enhancing rock permeability and facilitating fluid flow and mass transfer This is the main theme of this interdisciplinary volume and the papers included are intended to provide an overview of current ideas at the interfaces of structural geology fluid flow and mineralization research

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