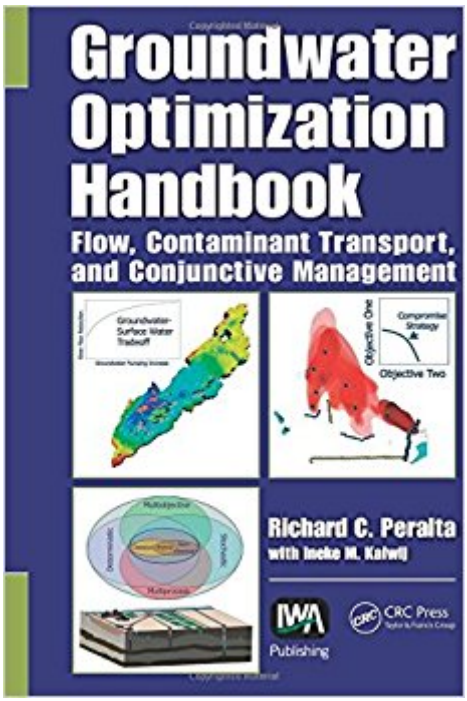
Groundwater Optimization Handbook: Flow, Contaminant Transport, And Conjunctive Management



Synopsis

Existing and impending water shortages argue for improving water quantity and quality management. Groundwater Optimization Handbook: Flow, Contaminant Transport, and Conjunctive Management helps you formulate and solve groundwater optimization problems to ensure sustainable supplies of adequate quality and quantity. It shows you how to more effectively use simulation-optimization (S-O) modeling, an economically valuable groundwater management tool that couples simulation models with mathematical optimization techniques. Written for readers of varying familiarity with groundwater hydrology and mathematical optimization, the handbook approaches complex problems realistically. Its techniques have been applied in many legal settings, with produced strategies providing up to 57% improvement over those developed without S-O modeling. These techniques supply constructible designs, planning and management strategies, and metrics for performance-based contracts. Learn how to: Recognize opportunities for applying S-O models Lead client, agency, and consultant personnel through the strategy design and adaptation process Formulate common situations as clear deterministic/stochastic and single/multiobjective mathematical optimization problems Distinguish between problem nonlinearities resulting from physical system characteristics versus management goals Create an S-O model appropriate for your specific needs or select an existing transferrable model Develop acceptable feasible solutions and compute optimal solutions Quantify tradeoffs between multiple objectives Evaluate and adapt a selected optimal strategy, or use it as a metric for comparison Drawing on the authorÃ¢â ¬â„¢s numerous real-world designs and more than 30 years of research, consulting, and teaching experience, this practical handbook supplies design procedures, detailed flowcharts, solved problems, lessons learned, and diverse applications. It guides you through the maze of multiple objectives, constraints, and uncertainty to calculate the best strategies for managing flow, contamination, and conjunctive use of groundwater and surface water. Ancillary materials are available from the Downloads tab on the book page at www.crcpress.com.

Book Information

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Customer Reviews

"In my experience, most text books only cover the theory behind a topic and go into great detail on the research and derivation of various methodologies. However, practitioners in the field also need to know how the theoretical underpinnings of the science get applied in the real world. Few books actually accomplish this and thus are not really all that useful to those of us who "get our hands dirty". Dr. Peralta's book covers both aspects quite well. The theory behind various optimization techniques is presented along with how these theories and methods are used to solve real problems. The examples in the book are not just small synthetic problems that bear no resemblance to reality. They illustrate the solution to large-scale, real optimization" Ã¢â ¬â ¢James Rumbaugh, Environmental Simulations, Inc., Reinholds, Pennsylvania, USA"The book provides a good summary of the fundamental optimization techniques from the classical approaches to the current state-of-the-art methods, but provides excellent guidance on the appropriate application to ground water problems. The book illustrates most of the important concepts with simple theoretical examples and/of real-world applications of the techniques. The efficient application of these techniques requires experience and perhaps intuition, and Dr. Peralta has tried his best to convey some of the insights from his extensive portfolio of successful optimization projects to the reader. The strength of the book really lies beyond the early chapters covering the basics of optimization; it is in the discussion of these actual applications."Ã¢â ¬â ¢David J. Becker, University of Nebraska at Omaha

Richard Peralta, PhD, PE, has used S-O modeling to design strategies for more than 20 sites or real-world projects. As a Utah Cooperative Extension Service water quality coordinator, he optimized nonpoint and point source contamination management, and collaborated with state and federal agencies in technology transfer and public education. Through the University of Arkansas, and subsequently Utah State University, private work, and the U.S. Air Force Reserve, he worked in

25 U.S. states and in numerous countries. For the military, he participated in and led many environmental contamination remediation evaluation teams and helped provide optimal solutions that were successfully implemented in the field. After several years of advising on environmental matters in the Pentagon, Colonel Peralta retired from the U.S. Air Force Reserve as a chief bioenvironmental engineer. He is a professor in the Civil and Environmental Engineering Department at Utah State University, consults privately, and is the distributor of SOMOS software. For more information, see Dr. PeraltaÃ¢â ¬â„¢s page at the College of Engineering at Utah State University. Contributing author Ineke M. Kalwij, PhD, PEng, collaborates with Dr. Peralta, working on groundwater optimization software development and publications. She also provides consulting services to clients, primarily in the area of groundwater system management. For more information, see Kalwij Water Dynamics Inc.

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