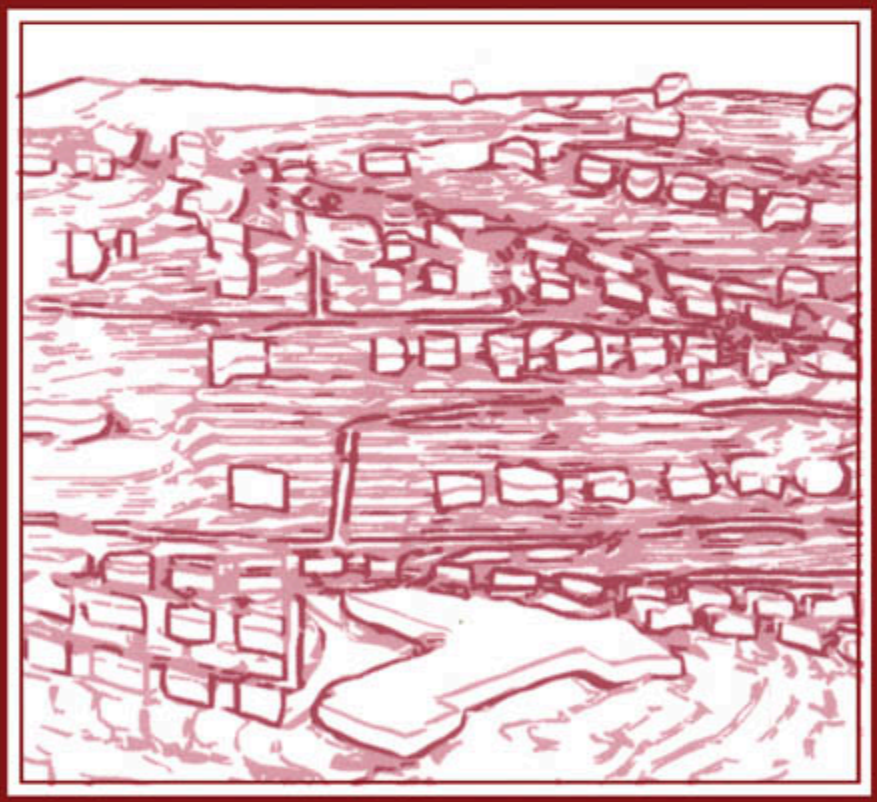
GIS Tools for Water, Wastewater, and Stormwater Systems



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Abstract: Data and software are the two most important tools for developing GIS applications. This book focuses on GIS data and software for water, wastewater, and stormwater systems. With appropriate GIS data and software, the possible means to manage water, wastewater, and stormwater systems are almost endless. This book is intended as a reference book on GIS data and software for water, wastewater, and stormwater system applications. It is suitable for any professional involved in the management and operation of water, wastewater, and stormwater systems.

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DEDICATION

To my beloved parents

Mr. Manzoor A. Shamsi and Mrs. Roha M. Shamsi

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PREFACE

ABOUT THIS BOOK

It's a Monday morning in March 2002 in the Cleanwater City, population approximately 10,000 people. Bill, the wastewater treatment plant operator enters his office when the phone rings. The call is from a sewer customer who is complaining about his basement flooding. Bill immediately starts the City GIS and enters the customer address. GIS zooms to the resident property and shows all the sewers and manholes in the area. Bill highlights the sewer segment adjacent to the customer property, launches the work order module, and completes a work order for TV inspection. The export button saves the work order form and a map of the property and adjacent sewers in a Microsoft Word file. Bill immediately e-mails the Word file to the City's sewer cleaning contractor. The entire process, from the time the customer called, took about 15 minutes. This book presents the tools required to accomplish applications like this.

Experts believe that in the near future, most water, wastewater, and storm-water system professionals will be using GIS in the same way they have used a word processor or spreadsheet.

More than 80% of all the information used by water, wastewater, and stormwater utility companies is geographically referenced, that is, a key element of the information is its location relative to other geographic features and objects. An information system is a framework that provides answers to questions from a data resource. A Geographic Information System (GIS) is a database of spatially distributed features and procedures used to collect, store, retrieve, analyze, and display geographic data.

The typical local government office contains hundreds of maps displaying municipal boundaries, property lines, roads, sewers, water lines, voting district boundaries, zoning areas, flood plains, school bus routes, land use, streams, topography, soil types, and so

on. Paper maps, after all, have been the traditional method of storing and retrieving geographically referenced information. The sheer number, range of types, and diversity of maps used by municipalities are evidence of the importance geographically referenced information plays in our day-to-day operations. Unfortunately, the wide variety of maps and the diversity of their scales and designs at our disposal make it extremely difficult to access, use, and maximize the value of the information they contain. GIS is an integrating technology; it integrates all kinds of information and applications with a geographic component into one manageable system. GIS offers integrated solutions in the areas of planning and engineering, operation and maintenance, and finance and administration. For example, GIS can integrate multiple utilities, such as water, wastewater, and stormwater systems, in one information system.

GIS is one of the most promising technologies of the millennium. The widespread use of GIS can be exemplified by the fact that about 25% of the annual American Water Works Association (AWWA) Information Technology Conference is dominated by discussions concerning GIS applications. The time has come for all the professionals involved in the planning, design, construction, and operation of water, wastewater, and stormwater systems to enter one of the most exciting new technologies in their profession— GIS.

The Author was inspired to write this book by teaching ASCE's continuing education seminar, "GIS Applications in Water, Wastewater, and Stormwater Systems." The seminar has been attended by hundreds of water, wastewater, and stormwater professionals in major cities throughout the United States.

This book focuses on GIS data and software for water, wastewater, and stormwater systems. Data and software are the two most important requirements for developing GIS applications. The first step in developing a GIS is to acquire software to create GIS databases and layers. This requires a careful review of available software packages. People spend a lot of time in selecting the best software for their GIS applications. Data is the most important component of a GIS. Without data, you simply have a computer program, not a GIS. You should be aware of the intended use and accuracy of your GIS

data. Data quality and accuracy should be evaluated in the context of the GIS application in which the data will be used.

This book will show you that with appropriate GIS data and software, the possibilities to manage your water, wastewater, and stormwater systems are almost endless. This book is intended to be a reference book on GIS data and software for water, wastewater, and stormwater system applications. It is suitable for any professional involved in the management and operation of water, wastewater, and stormwater systems. It is ideally suited for civil and environmental engineering project engineers and project managers. Other professionals, such as consultants, system analysts, GIS technicians, planners, university researchers and professors, city managers, water and sewer utility personnel, and government employees involved in GIS- and water-related work will also find this book useful.

STYLE OF THE BOOK

This book has been written using the recommendations of the Accreditation Board for Engineering and Technology (ABET) of the United States and ASCE's Excellence in Civil Engineering Education (ExCEEd) program. Both of these programs recommend performance- or outcome-based learning in which learning objectives of each lecture (or chapter) are clearly stated up-front and the learning is measured in terms of achieving these learning objectives. Each chapter of this book accordingly starts with learning objectives for that chapter and ends with a chapter summary and practice problems referred to as "self evaluation." In academic settings, self evaluation problems can be used as homework assignments.

The objective of this book is to document GIS data and software tools that are appropriate for developing GIS applications for water, wastewater, and stormwater systems.