## GROUNDWATER AND SURFACE WATER POLUTION

Suranaree University of Technology

Edited by

David H.F. Liu Béla G. Lipták

## **Contents**

Groundwater and Surface Water Pollution 1		
1	Principles of Groundwater Flow 5	
1.1 1.2 1.3 1.4 1.5	Groundwater and Aquifers 5 Fundamental Equations of Groundwater Flow 10 Confined Aquifers 12 Unconfined Aquifers 16 Combined Confined and Unconfined Flow 19	
2	Hydraulics of Wells 21	
2.1 2.2 2.3 2.4 2.5	Two-dimensional Problems 21 Nonsteady (Transient) Flow 26 Determining Aquifer Characteristics 32 Design Considerations 43 Interface Flow 46	
3	Principles of Groundwater Contamination 48	
3.1 3.2 3.3	Causes and Sources of Contamination 48 Fate of Contaminants in Groundwater 52 Transport of Contaminants in Groundwater 62	
4	Groundwater Investigation and Monitoring 67	
4.1	Initial Site Assessment 67	

75

Subsurface Site Investigation

ð	Groundwater Cleanup and Remediation 85	
5.1 5.2 5.3	Soil Treatment Technologies 85 Pump-and-Treat Technologies 87 In Situ Treatment Technologies 107	
torr	m Water Pollutant Management 113	
6	Storm Water Pollutant Management 115	
6.1 6.2 6.3 6.4 6.5	Integrated Storm Water Program 115 Nonpoint Source Pollution 117 Best Management Practices 122 Field Monitoring Programs 127 Discharge Treatment 138	