

## SWMM-based Urban Storm Sewer System Modeling

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**Keywords:** storm sewer system, modeling, SWMM (Storm Water Management Model), equivalent pipe, Nash-Sutcliffe efficiency

**Abstract.** SWMM modeling plays an important role in the urban drainage system management. The paper depicts several modeling steps, including model parameters, dynamic wave options, CFL condition and equivalent pipe and model evaluation. For dynamic wave options, combination of "ignore" and "both" is relatively better than others. Impact of friction equation is very tiny. Especially, "Froude No." is recommended not to use, while "slope" can make a good result. For inertial terms, "ignore" is considered as the best option. Equivalent pipe is used to deal with SWMM numerical instability, and coefficient of correlation, Nash-Sutcliffe efficiency are used to assess modeling performance.

### Introduction

Simulation modelling plays an important role in the urban drainage system management. It is aimed at understanding and predicting the behaviour of the systems so that effective solutions to structural and operational problems can be tried out and evaluated. So simulation modeling is popular with cities all over the world. But how to build a successful urban storm sewer modeling is still a concern. In this context, it aims to depict SWMM modeling method using a case study.

The EPA Storm Water Management Model (SWMM) is a world famous dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas<sup>[1]</sup>. It is used as modeling platform in the paper.

### Case study

It consists of 158 nodes, 157 links, 28 sub-catchments and 3 rain gauges in the current project. The total area of the catchment is about 1462 hectare. Backwater effect from tide is very strong, and should be taken into consideration. So dynamic wave method is selected as pipe flow routing option in the project.

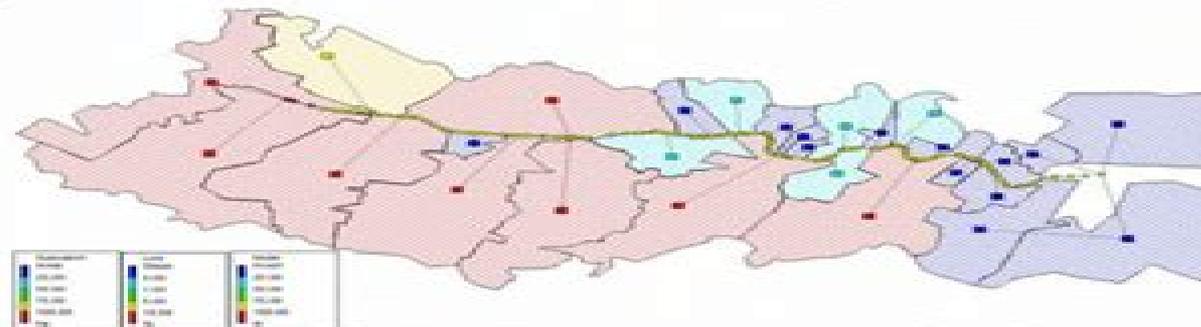


Fig.1 SWMM map of the case study

# Urban Storm Modeling And Stimulation

**Zhe Xu**



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*Urban Stormwater Modeling and Simulation* Stephan J. Nix,1994-07-13 Urban Stormwater Modeling and Simulation discusses several popular stormwater models and explains a variety of uses in practical terms This unique book is divided into five key sections and begins with a description of urban runoff problems and how computer models play an important role in problem solving The book continues with detailed discussions on the construction of watershed models model verification and validation the use of models for predicting stormwater runoff and pollution discharges and common problems associated with popular modeling programs A practical approach is used throughout the book focusing on actual applications to illustrate basic principles This is the first book available that provides both new and experienced engineers consultants and scientists with an organized approach to stormwater modeling and simulation model construction model verification and software selection Water quality professionals environmental engineering students technical libraries regulators and planners will also find this a perfect hands on learning tool

**Modelling, Simulation and Control of Urban Wastewater Systems** Manfred Schütze,David Butler,Bruce M. Beck,2011-06-27 by Professor Poul Harremoes Environmental engineering has been a discipline dominated by empirical approaches to engineering Historically speaking the development of urban drainage structures was very successful on the basis of pure empiricism Just think of the impressive structures built by the Romans long before the discipline of hydraulics came into being The fact is that the Romans did not know much about the theories of hydraulics which were discovered as late as the mid 1800s However with the Renaissance came a new era Astronomy Galileos and basic physics Newton started the scientific revolution and in the mid 1800s Navier and Stokes developed the application of Newtons laws to hydrodynamics and later St Venant the first basic physics description of the motion of water in open channels The combination of basic physical understanding of the phenomena involved in the flow of water in pipes and the experience gained by trial and error the engineering approach to urban drainage improved the design and performance of the engineering drainage infrastructure However due to the mathematical complications of the basic equations solutions were available only to quite simple cases of practical significance until the introduction of new principles of calculation made possible by computers and their ability to crunch numbers Now even intricate hydraulic phenomena can be simulated with a reasonable degree of confidence that the simulations are in agreement with performance in practice if the models are adequately calibrated with sample performance data

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**Comparative Analysis of Urban Stormwater Models** Albin Brandstetter, 1974 Eighteen mathematical models for the nonsteady simulation of runoff in urban storm and combined sewerage systems were reviewed in a study sponsored by the U S Environmental Protection Agency The models were evaluated on the basis of information published by the model builders and model users Seven models were also tested by computer runs using both hypothetical and real catchment data Most of the models evaluated include the nonsteady simulation of the rainfall runoff process and flow routing in sewers a few also include the simulation of wastewater quality options for dimensioning sewerage system components and features for realtime control of overflows during rainstorms     **Government reports annual index** ,199?

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