

Sensitivity Analysis of the Parameters of SWMM Based on Design Rainfall Conditions

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This study is a sensitivity analysis of the parameters which affect the simulation results under various design rainfall conditions, using the SWMM model, for three selected basins in urban areas. The sensitivity of the peak flow rate is defined by S_Q ($=1.0 - (\text{min. ratio of peak flow rate}/\text{max. ratio of peak flow rate})$), and the rainfall conditions are classified in terms of design rainfall frequency, duration, and distribution. The simulation results show that in most conditions the parameters – the impermeable area ratio, the sewer slope, and the initial infiltration capacity – have more significant effects on the results than other parameters. As the design rainfall frequency increases, the sensitivity of the sewer slope and sewer roughness increases, while the parameters related with the surface runoff decrease. When the rainfall duration increases, the sensitivities of most parameters of surface runoff and sewer flow decrease. Also, at the 1st quarterly Huff rainfall distribution condition, the impermeable area ratio has high sensitivity, but at the 4th quarterly condition the parameters related with sewer flow show higher sensitivities. These tendencies can be explained by considering the procedure for computing the effective rainfall and kinematic wave on the surface and sewer flow.

Keywords: Sensitivity of Runoff Parameters; Rainfall Condition; SWMM

Table 1: Sensitivity of parameters ($SQ = 1 - (Q_{p,min} / Q_{p,max})$)

Rainfall Conditions	Basin	Impermeable area ratio	Initial infiltration capacity	Basin width	Roughness	Sewer slope	Sewer Roughness
Design Year (30yr-30yr)	Namgaje	▼	—	—	—	▲	—
	Kings Creek	—	▼	—	▼	▲	▲
	Gray Haven	▼	▼	▼	▼	▲	▲
Rainfall Duration (0.5hr-3hr)	Namgaje	—	▲	—	—	▼	▼
	Kings Creek	—	—	—	—	▼	▼
	Gray Haven	▼	—	▼	—	▼	▼

(1) ▲ S_Q is more than 0.1 (2) ▼ S_Q is less than 0.1

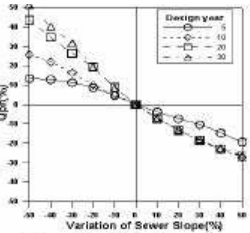


Figure 1. Sensitivity of sewer slope

References

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