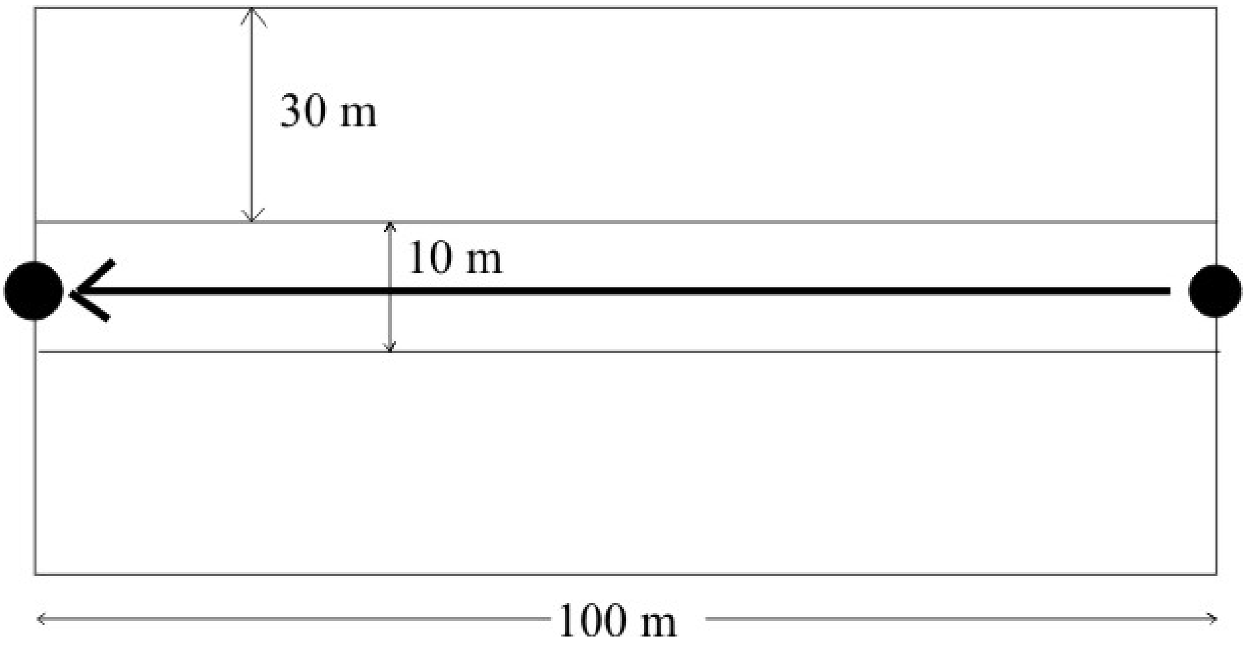
Example of calibration of the parameter W

Considering a typical case of a single family residential development (30% impervious) drained by a sewer line in the middle of the street. The street is of 10 meters wide and lots are of 30 meters deep.



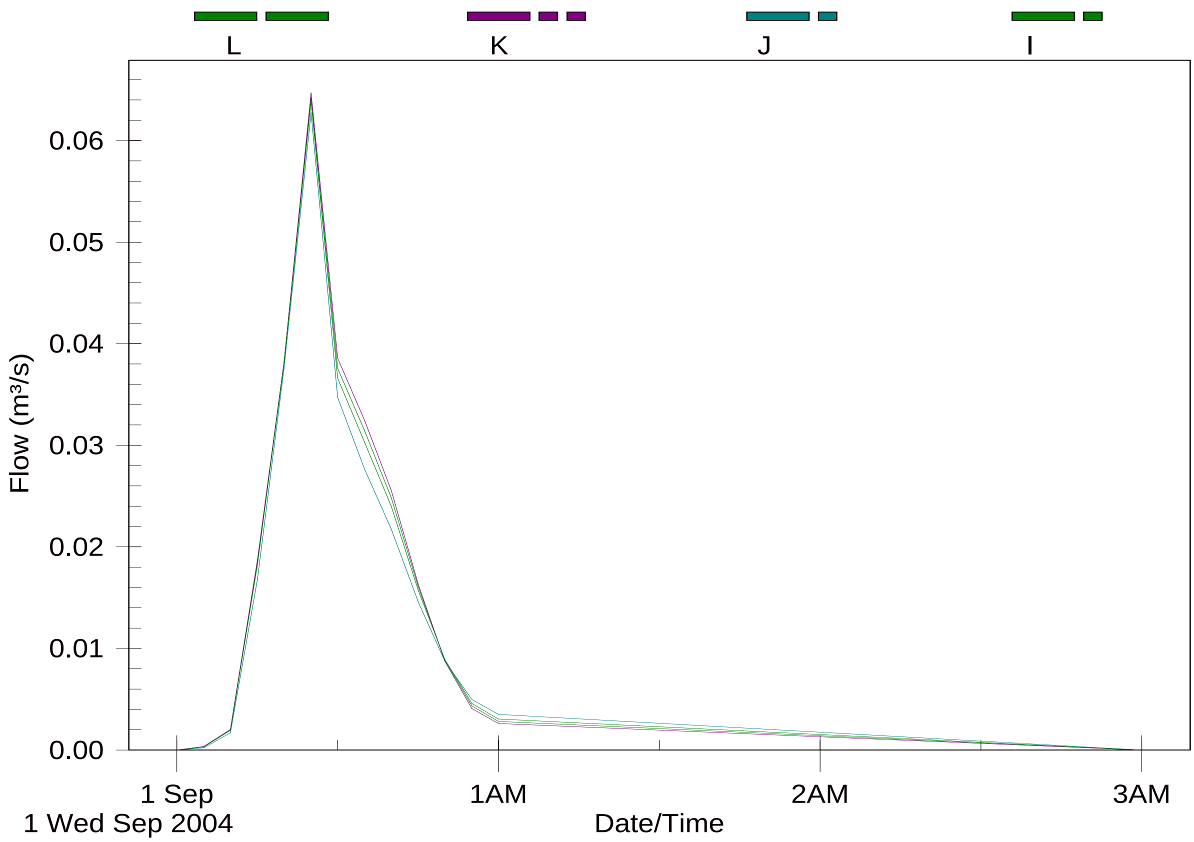
The total area of the basin in this case is 0.7 ha and it would therefore possibly the following definitions of W:

1. W = 2x100 = 200 m (classic definition of w by SWMM).
2. W = A / L 2 = 7000 / 2 * 35 = 100 m
3. W = A / longest length = 7000/30 = 233 m (assuming that each lot drains to the street and the longest length is the grass surface perpendicular to the street paving to the rear batches)

These three definitions of course, produce different answers and it is interesting to simulate the flow rate generated for this simple case and compared with the flow could be obtained for example with the rational method.

Figure on next page shows the results obtained with all three cases.

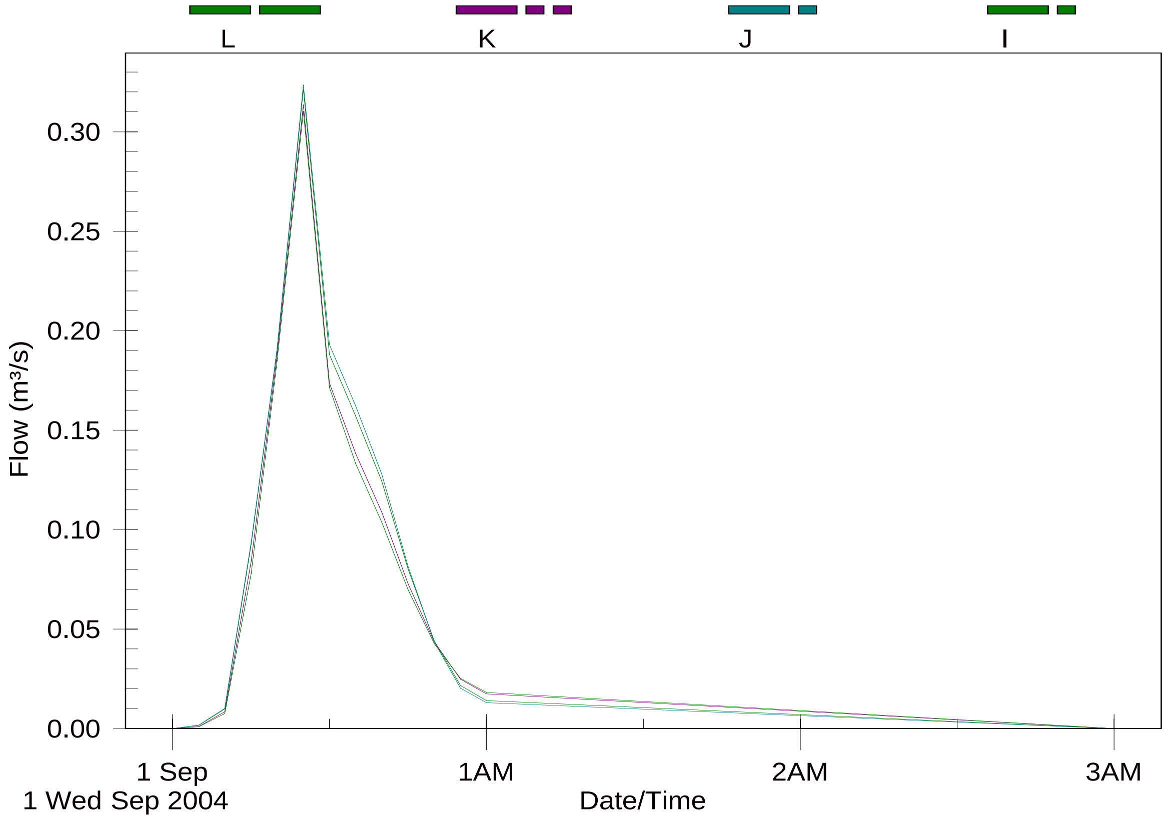
We note that the results are almost identical for all 3 cases and results in a peak flow of about 0,065 m3/s.



We can now continue with the exercise still considering the same depth but lots with a length of 300 m long (total area of 500 x 70 m = 3.5 ha). Always keeping the same definitions, we obtain 4 values of W the following:

1. W = 2x500 = 1000 m (classic textbook definition SWMM).
2. W = A / 2 L = 35000 / 2 * 35 = 500 m (Figure 3).
3. W = A / longest length = 35000/30 = 1167 m (assuming that each lot drains to the street and the longest length is the grass surface perpendicular to the street)
4. W = 2 = 374 m

Figure on next page shows the results obtained.



Again, we find that the effect is minimal on this scale. In fact, the variation of W has more effects for large sub-basins with a significant percentage of permeable surfaces. It must be remembered that a reduction of W increases the storage in the basin. So if we make a global simulation of a large area without considering the network of pipes, it will decrease to offset W and artificially increase the storage. Tests showed in 1970 that taking W as 1.7 x length of main sewer in a sub-basin for which we neglect the network gave good results. This information may be useful to aggregate (lump) several small basins.

Figure on next page finally provides a sensitivity analysis for the case (A = 3.5 ha) for W and percent impervious (case with the classical definition of W (= 2xl).

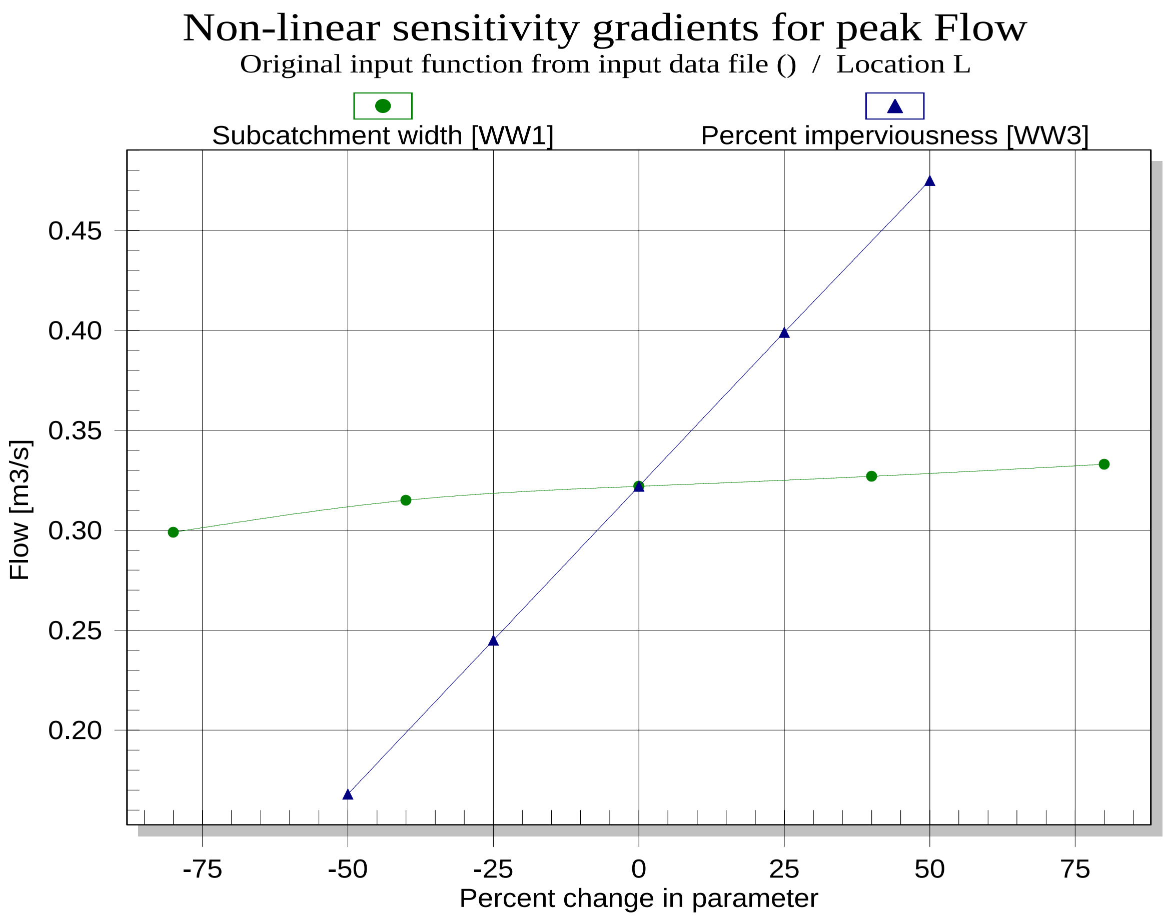


Figure 4. Sensitivity Analysis for W and percent impervious (A = 3.5 ha)

By comparison, if we take the rational method with a concentration time of 12 minutes and a coefficient C of 0.4, we obtain for the sub-basin of 3.5 hectares a flow rate of about 0.34 m3 / s.