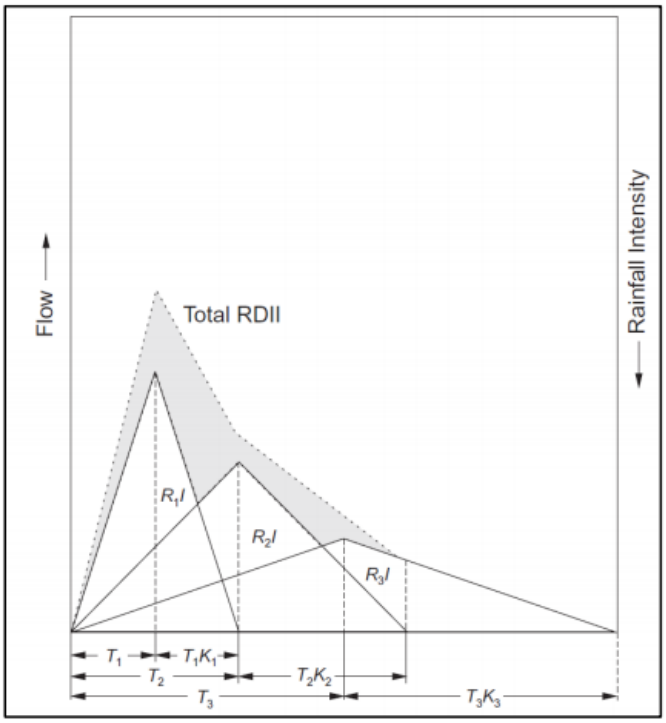
Background

The Toronto Basement Flooding Capacity Studies is part of a larger programme of works, the Basement Flooding Protection Programme for the City of Toronto in Canada. The objective of the wider programme is to reduce the risk of future basement and surface flooding resulting from under-capacity in Toronto's drainage systems. The objective of the Capacity Study phase is to develop an understanding of the system capacity constraints and flood risk through the incremental development of InfoWorks ICM models and develop conceptual solutions to address these constraints and risks. This paper describes an alternative method to a traditional flow monitor and model calibration exercise to derive wet weather flows (**WWF**) for the wastewater network.

What did we do?

The Wellington team were tasked with establishing the existing sanitary collection system performance and deriving WWFs. Programme was a critical driver for the client, and a traditional data collection and calibration approach would have conservatively taken several years to plan, undertake and execute. The associated procurement and consultation fees could have run into the millions. Instead, the client requested an alternative assessment where flows were generated using the application of **RTK** parameters.



The RTK Method

RTK Hydrographs can be specified as part of the sub-catchment data and are used to determine RDII (Rainfall Derived Infiltration and Inflow) entering the system. This method would typically be used to model the extra inflow during and immediately after rainfall events, caused by seepage of rainwater into defective pipes, ill-fitting manhole covers etc. However, in this case it was used to generate all wet-weather response to the wastewater system.

InfoWorks ICM uses the RTK method to generate a hydrograph used to determine RDII from a sub-catchment. Each set of RTK parameters defines a triangular graph against time, where:

- R is the area under the graph representing the proportion of rainfall falling on the subcatchment that enters the sewer system,
- T is the time from the onset of rainfall to the peak of the triangle, and
- K is the ratio of "time to recession" to the "time to peak" of the hydrograph.

In our methodology, flows were generated by adjusting the "R1" value (i.e. the short-term response) only, to achieve a design-criteria target flow rate of 3L/s/ha.

Outcomes

The RTK method allowed the project to progress much quicker than a traditional flow survey and calibration approach would have and resulted in significant cost savings.

There were also limitations to the approach. The approach often created overly conservative flows and predicted flooding where there were no flood records to validate against. In several instances we were unable to achieve the target flow of 3L/s/ha without increasing the “R1” value significantly. These occurrences typically fell into the following categories:

1. Flow being lost from the system via bifurcations or surface flooding,
2. Incapacity in the receiving trunk sewer or pumping station, and
3. Incapacity in the “local” sewer i.e. pipe incapacity.

After submission of this stage of the project, meetings were held with the client to discuss the outcomes, particularly around using the RTK methodology and the 3L/s/ha value. These discussions are ongoing, and I hope to be able to share an update at the conference. However, the overall benefit from this approach was significant in allowing our client to develop conceptual solutions within their budgets and timeframes.