Development of a city-wide Drainage Model to assess System Performance

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Biography:
Celine completed a Master of Engineering in Water and Environment (Strasbourg, France) before moving to Australia in 2006. She has over 10 years of experience in hydrologic and hydraulic modelling, both in the public and private sector. Since joining Water Technology in 2011, Celine completed a wide range of stormwater projects including flood modelling and mitigation, design of WSUD assets, stormwater harvesting and integrated water management studies. More recently, Celine has applied her hydrologic and hydraulic modelling skills to the development of complex InfoWorks ICM (Innovyze) models, modelling numerous catchments across Victoria. Celine project managed an innovative large ICM modelling project combining potable, sewer and drainage networks into one single model and recently delivered a Melbourne city-wide drainage model in 1D for Melbourne Water.

Melbourne Water (MW) is currently developing system performance assessment tools for their water, sewer and drainage networks, to enable the completion of a system wide assessment of performance and assist integrated water planning. With the existence of InfoWorks models for both the potable and sewer networks built and regularly calibrated over the last decade, MW is aiming to fill in the gaps by developing a one-dimension (1D) drainage network model in InfoWorks ICM (Innovyze) of the Melbourne metropolitan area and urban growth.
This project is the first stone to building a living drainage network model to be updated, calibrated over time and used to assess the performance of the system under current and future scenarios. The first lot of priority catchments modelled and preliminarily assessed over a range of scenarios include the Patterson River, Elster Creek, Mordialloc Creek, Kananook Creek and the Mornington Peninsula. The 1D drainage model includes all the MW underground drainage infrastructure, some of the Council drainage trunk mains, open drains, natural waterways and retarding basins within the catchment extent. It was run for the 5 year ARI design events using the Australian Rainfall and Runoff 1987 including spatial variability in order to identify the deficiencies in the network which is supposed to be design for and carry the 5 year ARI design storm. The model was verified against the MW 5 year ARI design flow values available from previous flood studies throughout the catchment. The existing conditions system performance was then assessed and presented in the form of thematic maps of pipe surcharges and maximum flow against pipe full capacity based on the Manning's equation. The existing conditions system performance assessment revealed specific hotspots where the drainage network is surcharged causing or not overland flooding (extent not assessed in this study) under the 5 year ARI. The 1D drainage model was assessed over a range of future scenarios including climate change and increase in population in line with the Victoria in Future 6 million (2031), 7 million (2041), 8 million (2051) and 10 million (2061) predictions to assess the needs for future infrastructure upgrade.