C.C. Tatham & Associates Ltd. Stormwater Management Project, City of Barrie

A Comprehensive
DATABASE and
QUANTIFIED
UPGRADES

Mean the City of Barrie will stay above water

In the last 20 years, the City of Barrie, Ontario, has experienced many severe flooding events that have caused damage to public and private property. Many of the city's drainage systems pass through or nearby the downtown core, or critical infrastructure like Highway 400 and the city's wastewater treatment facility. To alleviate these risks, the city's stormwater infrastructure needed to be improved.

However, accurate information regarding the deficiencies in the city's drainage infrastructure was lacking. This is because past efforts to understand the city's minor and major stormwater drainage systems were modelled on a piecemeal basis using a variety of modelling software, while using inconsistent parameters and methodologies. As a result, the understanding of the deficiencies within the system were inconsistent and anecdotal in many cases.

To better understand its stormwater infrastructure, the city engaged C.C. Tatham & Associates Ltd. to develop, calibrate and verify comprehensive hydrologic and hydraulic models of the city's minor and major drainage systems. This would allow for consistency in the assessment of storm infrastructure, improved efficiency in maintaining and sharing modelling data, and allow for global assessments of the sensitivity
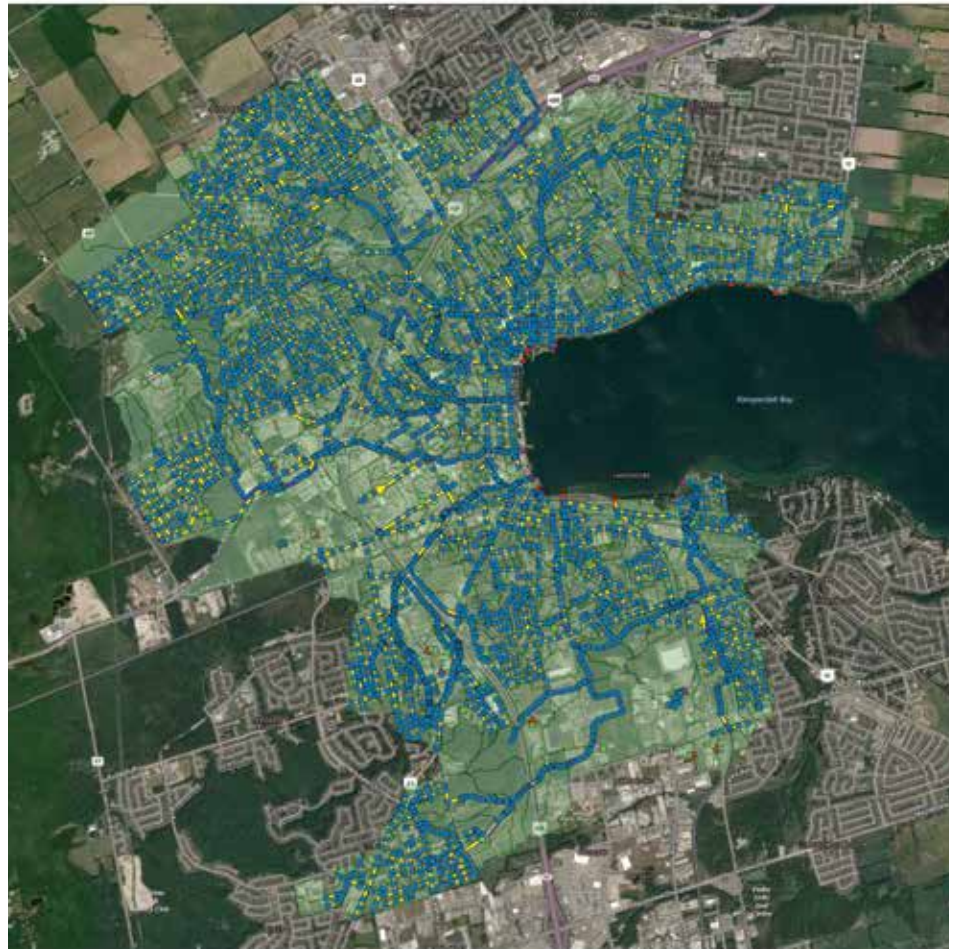
of the models to climate change and changing hydrologic parameters.

The first phase of the project was to generate this tool. The second was to test its effectiveness by completing a master drainage plan and environmental assessment for Sophia Creek, one of the city's main watersheds. The second phase allows for implementation of the models through the master drainage plan by using the models to predict the most effective alternatives to improve deficiencies, reduce flooding and erosion, and eliminate public safety hazards.

"For the first phase of model development you had to be very careful to get a process in place to go through the existing data to get it organized or you'd be completely buried in numbers and data, so that was probably the biggest challenge at the outset," says C.C. Tatham's Dan Hurley, who served as an adviser on the project.

Working with city and local conservation authorities, C.C. Tatham used the city's geographic information system (GIS) to establish a comprehensive database of its existing storm infrastructure, things like pipes and manholes. As well, light detection and ranging (LiDAR) data from 2007 was also used to provide an accurate digital elevation model for the entire city. With the database completed, PCSWMM minor drainage system and Visual Othymo / HEC-RAS major system models were selected for the hydrology and hydraulic analysis. The programs were selected because they are GIS compatible and capable of working with such vast amounts of data.

The city's 23 watersheds/drainage areas have a total drainage area of approxi-

mately 92 square kilometres, which includes more than 8,000 catchment areas and 181 stormwater management facilities. Hurley says C.C. Tatham has worked on similar projects, but they were much smaller in scale and would cover a single watershed, not 23 of them. The minor storm infrastructure model covers 403 kilometres of storm sewer and more than 7,400 storm structures.

Because the model is completely GIS integrated, it allows for continual upgrading, which helps ensure it can be used well into the future. The impact

of the project is already being felt. "For almost every project the City of Barrie undertakes, whether it's reconstructing a road or looking at a new development or evaluating their priorities to do repairs, this model is being used by the city or the consultant they hire to come up with the right solution. It's a living model they get to refer back to for every project and say, 'Well, let's update this structure and this structure because we're replacing this road and look at how much better the drainage system works,'" says Hurley. ●