FLOOD MODELLING EFFICIENCY WITH DIGITAL AUTOMATION

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ABSTRACT

After the earthquakes in 2010 and 2011, Christchurch City Council (CCC) built citywide flood models, integrating multiple individual subcatchment and trunk models across the city into five main river catchments (Avon, Heathcote, Styx, Sumner and Halswell). The Avon River catchment model was completed in 2018 by GHD and this model is currently being used to investigate the resilience of the city against future climate change (including sea level rise), earthquakes and urbanisation. The DHI Mike Flood model is computationally large in all three primary components (MU, M11 and M21) covering 145 km^2 of land, 150 km of waterways and 350 km of pipes.

This presentation will explain the automation approaches the team has undertaken to generate model input files and to batch model runs with improved consistency and reduced time and costs. We will detail the challenges and how they were identified and addressed. During the presentation we will also contrast the various programming software used (Python scripting, ArcGIS, Visual Basic and Batch files) and how they suited each purpose.

This project required setting up and running approximately 200 Mike Flood models in batches covering combinations of future time horizons, flood return periods, tidal conditions and design storm durations. The presentation will outline the procedures used to create various input files required for each model scenario including raw data processing and for use in the model runs. We will also illustrate the methodology used to assign the input data to the various model scenarios and the database process utilised to create the model setups in batch.

In order to reduce the total computation time, the computational work had to be shared across multiple computers. How model scenarios were batched and load shared to facilitate this will also be discussed. Model computations needed to be monitored so we could investigate computational failures and make adjustments before the batch was completed. We will illustrate the approach used in this project to monitor the 200 model runs progress and status efficiently.

All the M21 results needed post processing to summarise them into formats that are useful for the Council, primarily GIS raster format max of max flood depth results. We will demonstrate the approach used in this project to post-processing up large numbers of results by utilising programming and ArcGIS skills.