ABSTRACT TITLE

REGENERATION OF CHRISTCHURCH STORMWATER MODELLING - AVON CITYWIDE 2.0 DELIVERED

TIM PRESTON, GHD

KEYWORDS

stormwater, flooding, modelling, computation, coastal, joint probability, Avon, Christchurch, hydrology

A massive package of flood modelling work has been delivered successfully for Christchurch City Council improving their knowledge and ability to plan for their future. This was the first modelling to benefit from their "Joint Risks of Pluvial and Tidal Flooding" work completed in 2020.

Councils with comparable topography and/or coastal challenges may be interested in the technical challenges that were resolved and the new data tools which have been developed. There are also lessons learned about model behaviour in unusual circumstances which other flood modellers should be aware of. We will also outline how we found other issues that are still being worked on.

The modelling provided Christchurch with a better understanding of flood risks to inform their coastal hazard adaptive planning programme. The coastal environment is subject to flooding from rainfall and from sea inundation (storm surge), and the joint risks of coincident events, all of which have uncertainties including predictions of significant future changes. The project also served more general catchment wide needs to understand flood risks for building controls and district planning requirements.

The previous Avon flood model (DHIv2020) was updated and enhanced in several areas, to meet the various objectives. The floodplain topography was updated to recent LiDAR and the infiltration approach was modified to represent current and future predictions of elevated groundwater levels. Infrastructure considered material to flood system performance was updated across the model.

Since 2015 several large projects have been completed to improve Christchurch's ability to manage and reduce flood risks. The most notable projects were Cranford Basin and its associated active management system, Tay St pump station and Dudley Bypass. Modelling of the active management system required use of an active Mike 11 control structure (gate) and Mike Urban real time controls (pumping) based on two interacting water level sensors.

The objectives resulted in 43 model scenarios. The approach to use of design storms of specific durations and the need for a tidal pairing model runs resulted in 210 individual model runs, each of which was 'large' in its own right with a total data deliverable of 850 Gb. All results were summarised into max_of_run and max_of_scenario in ArcGIS raster gdb format for practical client viewing, together with numerous other formats for primary deliverables, differencing analyses and quality control reporting.

The conversion from distributed Hortons infiltration to a constant infiltration model with fixed capacity was an immediate success with results delivering the expected spatial and temporal progression of groundwater saturation and the calibration result at the main Gloucester St gauging site improved.

Results inspection has noted areas for future improvement, with unsuitable results on the linking between floodplain and river models in unusual conditions and also in locations where road surfaces over short culverts were omitted from the modelling but sometimes found to be important. Large scale result inspection tools are being developed to highlight such concerns and motivate improved future modelling schematisations either locally or across the entire model.