



The Importance of Sensitivity Tests

Andrew Sherson

Conducting sensitivity tests is a crucial step for understanding how a model behaves. Stantec, working in a consultancy panel for Wellington Water (WWL) and on behalf of the Greater Wellington Regional Council (GWRC), have recently completed the sensitivity for a 1D-2D integrated stormwater model of the Lower Hutt region to the east of the Hutt River, referred to as the Eastern Lower Hutt (ELH) model. The model was built using Innovyze Integrated Catchment Modelling (ICM) software and contains the public stormwater assets known by WWL at the time of the commencement of the model.

Multiple sensitivity tests were conducted to determine how the ELH model reacts to changes in certain model parameters. These tests included increasing rainfall intensity by 50%, blocking all culvert inlets, partially blocking culvert inlets, blocking bridges, removing tidal inputs, removing the Hutt River as a boundary condition, and removing stormwater pumps from the network. These tests follow a standard approach for each of the models built as part of WWL's modelling panel.

Each of the previous Stantec models, including Petone, Wainuiomata, Stokes Valley, and Southern Wellington Central Business District, showed minor changes to flood extents in all but the increase in rainfall, which showed significant changes to flood extents. The ELH model instead showed significant changes to all but the partial blockage of inlets. This is because three-quarters of the model drains to the Opahu, Awamutu, and Waiwhetu streams, which rely on the conveyance capacity of pump stations, culverts, and bridges. Furthermore, the Seaview area and lower reaches of the Waiwhetu stream are low-lying and are thus significantly prone to changes in sea level. Additionally, all regions that do not drain to the open channels are reliant upon levels in the Hutt River. This is because much of the region is a flood plain with limited available head. In some areas, such as around the Opahu Pump Station, the sensitivity tests show localized changes in flood levels of around 1m while the four other pump stations in the ELH model show little to no change. This highlights the importance of the Opahu Pump Station on the network and thus prompts careful attention to ensure that it is modelled correctly and that any optioneering focuses on this pump station.

Overall, the sensitivity tests revealed that there are many factors to consider for the model and prompted conservative freeboard levels. Parts of the sensitivity results were also used to develop options for improvements for the network as part of the regional growth planning, removing areas such as Seaview from development plans due to it being prone to sea level rise. Overall sensitivity tests provide a useful insight into how a model behaves and highlight areas that need further consideration.