

Streamlining Modelling & Reporting for Continuous Simulation Modelling of Stormwater Pollutants and Runoff

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Abstract:

Creating reports and models for continuous simulation modelling (CSM) of stormwater pollutants and runoff (for WSUD / Rainwater Reuse / IWM / Land development / environmental improvement / infrastructure development / other projects) across Australia traditionally requires consultants to spend large amounts of time. The time is traditionally spent scouring guidelines for obscure parameters and files, manually entering values in difficult to use software and convoluted optimization and reporting process. This leads to reports based on models rife with errors, which are difficult to verify. To address this, John Connor Online (JCO) integrates guidelines, documentation, files and parameters into a modelling interface. Optimization is achieved via a highly simplified process compared to legacy software and comprehensive reports are generated automatically from the guidelines-compliant model.

Keywords: Stormwater Management; Stormwater Quality; Stormwater Modelling; Software Tools; Continuous Modelling

1. INTRODUCTION

Continuous simulation modelling (CSM) of pollutants and runoff is used in Australia to create stormwater quality models and reports (for WSUD / Rainwater Reuse / IWM / Land development / environmental improvement / infrastructure development / other projects). Examples of software tools use for this are John Connor Online (JCO), SU Calculator (SU), MUSIC 6 & MUSIC X (Modelling for Urban Stormwater Improvement Conceptualisation). The current processes used in the industry to create stormwater quality models and reports are inefficient, challenging and present an opportunity for innovation and improvement.

2. CHALLENGES

Challenges in the current process include time and resource costs. For consultants, a myriad of location specific guidelines and documentation need to be reviewed and assessed to create a compliant model. This includes usage of appropriate meteorological templates, pollution generation parameters & treatment performance (manufactured and constructed devices). An example of this is seen in the list of pollution generation parameters for different catchment types in NSW MUSIC Modelling Guidelines 2015 (BMT WBM Pty Ltd, 2015). This is only a fraction of the parameters that the industry needs to consider when creating a compliant model. Similarly, for the model itself, many authorities have guidelines on the modelling process including limitations on treatment devices, specified source pollutant generation values, alterations of treatment performance values and more. As a process, there is a significant room for improvement. Standardised modelling and reporting bring significant cost and quality benefits to both authorities and consultants. A streamlined process is needed to minimise errors, ensure compliance with guidelines and reduce time and resource costs.

3. SOLUTIONS

JCO is a web-based software tool designed to address these challenges with the goal of streamlining reporting and modelling for CSM of stormwater pollutants and runoff. The tool is easily accessible through most browsers and allows the development of stormwater quality models & reports compliant with council/authority guidelines established based on latitude and longitude. This allows JCO to be scaled and implemented anywhere in the world. Once the model is created, the user interface (Fig. 1) provides guidance, drawings and optimisation tools, which save hours of trial and error. Once optimisation is finalised, modellers can run the model results, perform further analyses and obtain a compliant WSUD report immediately on a button click.

The results are run using our the custom JCO mathematical modelling engine based on the foundational research for stormwater pollutant modelling published by Cooperative Research Centre for Catchment Hydrology

(CRCCH). JCO allows modellers to both; download and upload the MUSIC .msf file (which is akin to a .txt file that contains all model info such as catchments, links treatments etc.). This allows compatibility with MUSIC 6 and MUSIC X allowing authorities and practitioners economic freedom to choose the platform that best suits their needs and not be financially committed to only one software. The results from JCO are within stochastic variation when compared to MUSIC 6 and MUSIC X. It should be noted that due to code base differences, results will vary on the exact same model even between MUSIC 6 and MUSIC X. This variation is deemed acceptable as long it is within the stochastic variation inherent to the foundational research (done by CRCCH) underpinning pollution generation. A comparison between JCO, MUSIC 6 and MUSIC X results are shown in Fig 2. Research is being done as we speak and initial outcomes show there is no material difference between the MUSIC 6, JCO and MUSIC X modelling results.

The report contains detailed information on the catchment plan, the treatments characteristics and even provided typical drawings and weblinks to complete drawings of the devices. The model is embedded in a link within the report, ensuring model and report pairing is not lost. The model can be loaded via browser by any authority enabling verification of each model parameter, rainfall data used & catchment water balance. Verification becomes trivial and the only requirement is to confirm plans and drainage matches the model.

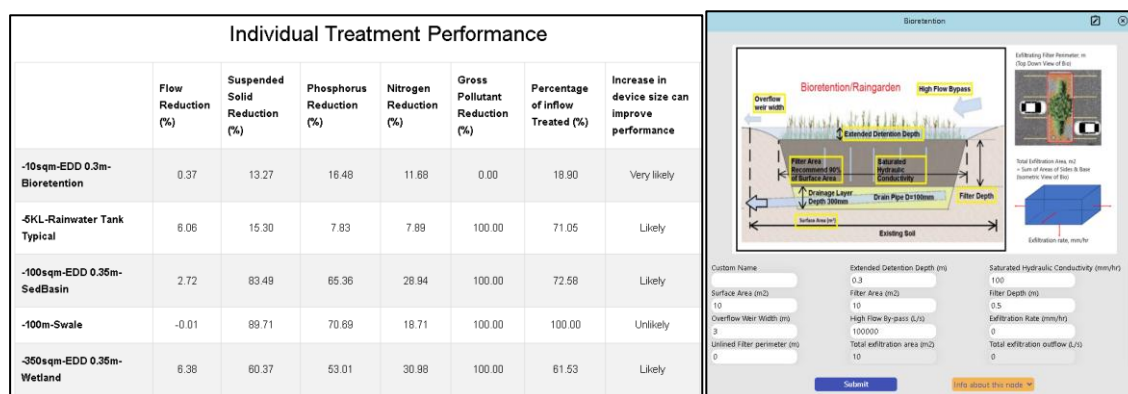


Fig. 1. (Left) Optimisation tools indicate which treatments are underperforming and require adjustment of parameters. (Right) Input interface contains infographics and functions as a guidance and educational tool for design.

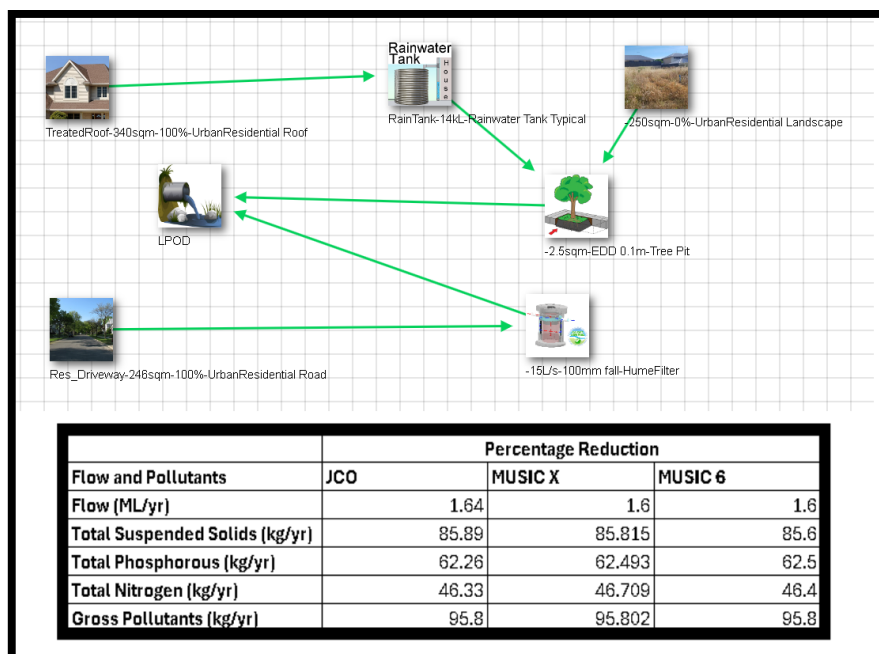


Fig. 2. Comparison between JCO, MUSIC 6 & MUSIC X for same model.

REFERENCES

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