

## Authors Response (AR) to RC #3

*The manuscript entitled “An Algorithm for Deriving the Topology of Below-ground Urban Stormwater Networks” proposes a novel algorithm for estimating Below-ground Urban Stormwater Networks (BUSNs) from existing data based on the Graph theory concepts. The paper is interesting. However, the manuscript has some shortcomings which need to be improved prior to its publication. The recommendation is that the article needs Major Revisions before it can be considered for publication. The following suggestions must be revised:*

**AR:** We would like to thank you for your constructive comments and criticism, which we will carefully address in the revised manuscript. Below are our point-to-point responses to the comments.

1. *The abstract should be carefully rewritten as English expression needs improving and the structure is not as clear as the main part of the paper. The novel algorithm needs more explanation.*

**AR:** We will rewrite the abstract and add more explanation about the algorithm in the abstract.

2. *Now the approximate computation method of drainage capacity for urban flood modeling is a common method in the area where the BUSN data are sparse, this should be mentioned in the introduction section.*

**AR:** Thanks for suggestion, we will include this in the introduction.

3. *There are many drainage catchments in urban city, and the drainage pipe network is generally laid out according to the catchments. How to consider this in the algorithm?*

**AR:** Our proposed algorithm, provides BUSN, one of the most critical inputs, that are needed for flood modeling. However, using the generated BUSN in an urban hydrological model requires some post-processing operations to account for the interactions between the derived BUSN and other sewershed elements, which is beyond the scope of the current study.

4. *The article only describes the pipes without mentioning the rainwater nodes and inlets, which also play a great role in the urban flooding process.*

**AR:** As the title of our manuscript suggests, our algorithm provides an estimation only for the below-ground elements of an urban stormwater network. The surface urban drainage elements such as street inlets and manholes are not the subject of this study. Deriving the spatial layout and distribution of those above-ground urban drainage components requires considering hydrologic characteristics of urban areas such as precipitation and the location of river network and other bodies. This is however outside the scope of this manuscript and left for a future study. We will add this to the final section as a future direction for the manuscript.

5. *Validation section is weakly written. It is verified by the “covered” of the distribution of the pipe network, which is relatively rough, and there is no comparison of key parameters such as pipe diameter, slope, and flow direction.*

**AR:** We will improve the writing of the validation section in the revised manuscript. The current validation strategy is already the best we can come out with due to the availability and quality of real BUSN data over multiple urban areas. The validation strategy (even the algorithm itself) can be potentially further enhanced by adding more details for some small urban areas where BUSN data are available with good quality (which are very rarely available to the public at the first place). However, we may then lose the generality hence applicability over the regional scales, which is the utmost objective of this study. As mentioned in Section 3.1, unfortunately, the existing, publicly available BUSN data are very sparse. Furthermore, those data that are publicly available, generally, do not include pipe slope, size, and flow direction. As a result, we intentionally limited the scope of our study to only derive the components that we can validate, i.e., the topology of BUSNs not pipe sizes and slopes. Although we provide (hydraulically feasible) estimates of size, slope, and flow direction for derived BUSNs, since we cannot validate them, we do not emphasize them as important products of our algorithm.

6. *The author should check the whole manuscript carefully, there are some errors in the interpretation of the diagrams.*

**AR:** We will revise the interpretation, and the diagrams if needed, to make sure they are consistent with each other.