Directly Connected Impervious Areas in Residential Subdivisions in Western Sydney

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Overview
Research demonstrates that the use of Total Impervious Area for runoff estimation leads to the over-estimation of runoff volumes. However, newer residential catchments have a much higher lot density than the research catchments. Therefore, there is a need for data for Directly Connected Impervious Areas (DCIA) on current subdivisions.
As a step towards addressing the lack of impervious area data for current subdivisions a detailed evaluation was undertaken of DCIA for five residential subdivisions in four different Local Government Areas in Western Sydney. The results were compared with the guidance given in the respective Council guidelines. It is was found that the DCIA estimates are significantly lower than TIA in the Council guidelines.

Objectives
Industry Guidelines such as Australian Rainfall and Runoff 2016 recommend the use of Effective Impervious Area or Directly Connected Impervious Area (DCIA). However, residential subdivisions currently under development in Western Sydney have a much higher lot density than the catchments used in published research. The objective of this paper was to derive relationships for DCIA that reflect the higher lot densities in current residential subdivisions and can be applied to subdivisions with varying lot mixes.

Methodology
Four subdivisions, each in a separate Local Government Area, were selected for assessment to derive DCIA for low density residential development. In addition, medium density developments within two of these subdivisions were also selected. Roof areas for 70 lots were estimated from house and land package advertisements Driveway areas were estimated from the DCP requirements and the size of the garage. DCIA and ICIA in the sample area road reserve were measured from design drawings using CAD. The previously derived Lot DCIA relationships were combined with the road reserve measurements to estimate the total DCIA for each sample area.

Results

Results are provided comparing Lot size and roof area, Lot size and DCIA, and Lot Density and DCIA. It was found that there is a statistically valid linear relationship between lot size and DCIA. However, there is also wide scatter suggesting other factors also influence the dwelling size and thus the DCIA.

It was also found that the values of DCIA estimated were noticeably lower than the fraction impervious published in Council guidelines.

Conclusion

Relationships have been derived for DCIA for residential subdivisions in western Sydney. The use of DCIA is recommended for design of stormwater.