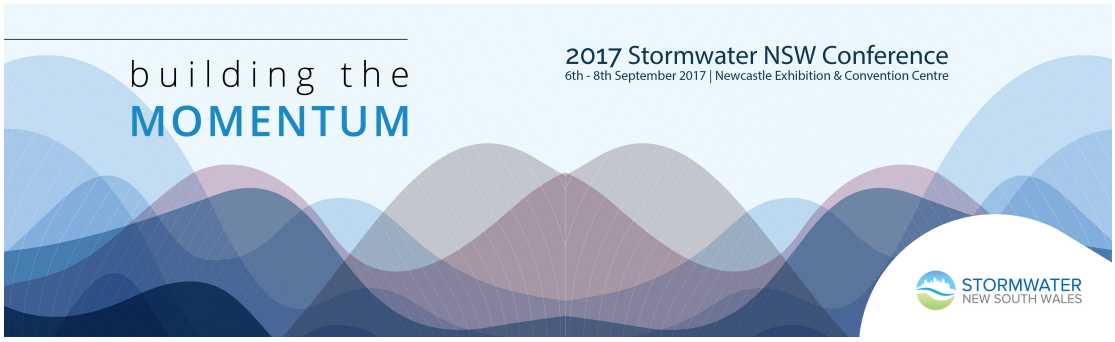

Physical Model Testing of an Improved WSUD Stormwater Strategy

Chris Drummond[1], Brett Miller[1], Ray Parsell[2]
[1]UNSW Sydney, Sydney, NSW, Australia, [2]Sydney Water, Sydney, NSW, Australia

Traditional engineering design of stormwater capture from urban roads involves an array of stormwater inlet pits connected to subsurface drainage. This results in all road runoff being continually delivered to stormwater drains which is generally poor quality and often polluted. Testing of standard inlets pits consisting of grates with lintels was previously undertaken by DMR (1979) demonstrating that grated inlets will capture 100% of low flows into the stormwater drains. An alternative design is to implement low flow bypass pits that divert low flows to a streetscape water sensitive urban (WSUD) facility while still capturing high flows in severe rainfall events.

Sydney Water have proposed an option to move stormwater inlet grates off the gutter invert for on grade road locations. This allows frequently occurring minor flows containing pollutants and debris, to remain in the gutter and flow into strategically placed WSUD facilities (e.g. a streetscape raingarden) at road sag locations. This reduces the environmental impacts of stormwater runoff during low flow events while still allowing severe rainfall events to be captured by the offset grates to maintain road functionality. This provides effective ‘at source' stormwater management and minimises ‘end of pipe' treatment that inefficiently deals with a blend of ‘clean' and ‘dirty' runoff sources.

This paper presents the results of physical laboratory testing undertaken at the UNSW Water Research Laboratory. Prototype scale (actual size) testing provided measurements of the proportion of flow continuing in the kerb and gutter compared with grate capture rates. Testing measured the capacity of grates under various configurations of roadway discharge (up to 150 L/s), number of grates, grate type and location, grade (0-10%) and crossfall (0- 5%). A total of six configurations were tested throughout the study comprising two grate types including a heavy duty diamond bar grate and a smaller pedestrian safe grate. The configuration layouts evolved throughout testing to refine the effectiveness of the systems by balancing bypass flows past the offset grates to maximise WSUD outcomes while maintaining road functionality at higher flows. Results indicated that the narrower pedestrian safe grate demonstrated a superior hydraulic performance due to a tendency towards orifice flow as well as exhibiting a self- cleaning ability of clogging material during qualitative blockage tests.

These results have demonstrated that Low Flow Bypass Pits in Water Sensitive Road Designs have the ability to capture high storm flows equivalent to traditional on-grade road inlet designs.