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# MODELLING OF MSMA COMPONENTS: POROUS PAVEMENT WITH DETENTION SYSTEM UNDERNEATH FOR LOW TRAFFIC ROADS

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*Abstract* – This study has been made in order to pursue practices in Water Sensitive Urban Design (WSUD), where stormwater management becomes a mainstream in Malaysia. The main focus of this study is to develop a stormwater conveyance model incorporating porous pavement and on-site detention system at Heights Drive (Stutong), Kuching City, and to investigate its effectiveness. Conventional pavements are impervious and create contaminated runoff. In contrast, combination of porous pavement with storage as WSUD approach allows stormwater to percolate to an underlying detention system where stormwater is both infiltrated to underlying clay soil and discharged with a lower rate to drain beside the road. Nine roads with total surface area of 12,660 $m^2$ are selected and a total of 6 scenarios are modelled and simulated using EPA's SWMM 5.0. It is found that the peak discharge at outfall from the study area is decreased by 23%, in which 2% of the stormwater is infiltrated to the ground for groundwater recharge.

***Keywords*:** *Control at source, runoff, subsurface storage, SWMM, water sensitive urban design*

## 1.0 INTRODUCTION

The impact of urbanization on the natural world has risen dramatically with decreases infiltration of storm water and increases runoff which against the balance of nature. The modern infrastructures such as roads, sidewalks, commercial and residential structures, cover the permeable terrain resulting in high surface runoff. The runoff then flows into urban storm water drainage. Disaster such as flash flood takes place when the urban storm water drainage design fails or frequent flows overwhelm the design capabilities. The surface runoff is directly discharged to rivers or streams via urban storm water drainage. Thus, harmful pollutants such as heavy metals, organic matter, oil and excess nutrients enter the storm water during the flowing processes from roof to sidewalk, to drains and to rivers.

As such, the pursuit of "sustainability" has emerged in recent years as a progression from previous "environmental protection" endeavours. Many communities have started incorporating Water Sensitive Urban Design (WSUD) practices into their water and storm water management plans and regulations [1]. Critical issues resulting from poor water management are concerned by federal regulations. For example, the Malaysian Department of Irrigation and Drainage has instituted *Mannual Saliran Mesra Alam* (MSMA) or Urban Stormwater Management Manual for Malaysia, since 2000. MSMA basically is a product driven by WSUD approach, addressing sustainability in storm water management. WSUD practices have been incorporated into many communities and projects, such as rain gardens, porous paving, green roofs, grey water and rain water re-use systems [2].

In this paper, the authors focus on porous pavement and underground detention storage. Conventional pavements are impervious and thus creating running water at ease. Contradictorily, porous pavement allows the stormwater to percolate under it and then infiltrate into the ground with time. Such pavement and associated detention system are normally represented in mathematics and thus can be modelled to provide insights of its limitations and effectiveness [3]-[4].