

**UNIVERSITI TEKNOLOGI MARA**

**FLOOD PEAK ATTENUATION MODELLING  
USING SOURCE CONTROL BMPs**

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## ABSTRACT

The expansions of urban centre areas are significantly causing the shrinkage of natural excess rainfall and runoff control systems. Natural vegetations are replaced with concrete surfaces which indirectly increase the impermeable areas, producing higher runoff and flow velocities that affect the existing settlements downstream. To cater the excess runoff volumes, the conventional drainage system suggest the rapid discharge method was adapted whereby the run off was drained fast from the urban areas into major drainage system before it could cause any flood damage. However, this approach has many drawbacks to drainage design including higher flood risks for downstream areas as well as excessive size of the drainage systems. This problem is faced by many communities, among them those settled in the Junjung River Basin which is the subject of this study. The basin is located in the State of Penang and has high potential to be developed in to an urban area in the near future. Thus, this thesis depicts a study conducted to cater the future developmental pressure to the drainage system by employing the Source Control Best Management Practice (SCBMP) as suggested in the Urban Stormwater Management Manual for Malaysia (DID, 2000). The main objective of this study was then, to reduce flood levels with applying one of the Best Management Practice method namely “detention pond” for peak flow attenuation. HEC-HMS and HEC-RAS, public domain software developed by the United States Army Corp of Engineers Hydrologic Center, were used for hydrologic and hydraulic modelling of the river basin and a 3.1 km study reach respectively. The river modelling configuration consists of on-line and off-line detention pond within the study area is significant in reducing flood level in Sg. Junjung for current condition. The result of this research also indicates that detention pond is an effective measure for flood peak attenuation for future development in Sg. Junjung but it must be complimented with minor channel improvement measures.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background and Motivation

Floods are natural phenomena that affect the communities across Malaysia especially the low-lying residential and causing millions of dollar in damage every year. The required allocation for flood mitigation projects have increased to RM 4 billion for the 9<sup>th</sup> Malaysian Plan compared to RM 2.7 billion during the 8<sup>th</sup> Malaysian Plan (Abdullah, 2006). Department of Irrigation and Drainage (DID) records shows that severe flooding had occurred in several parts in Penang during the storm event in the year 2003 (DID, 2004). Junjung River Basin which is located in Seberang Prai Tengah, Pulau Pinang was recorded as badly flooded area due to heavy rainfalls in five days (DID, 2003<sup>b</sup>). The flood problem is also due to the two periods of rainfall that associated with the advance and retreat of southwest monsoon, in April to May and September to November respectively. Though many flood mitigation projects has been implemented, the flood continued to occur during heavy rain event and damages the infrastructure and drainage as shown in Figure 1.1.



Figure 1.1: Flood problems in Seberang Prai Tengah due to heavy rainfall on 20<sup>th</sup> October, 1999 (The Star, 1999)