

**UNIVERSITI TEKNOLOGI MARA**

**DYNAMIC FLOOD INUNDATION  
MODEL – A CASE STUDY AT  
DAMANSARA CATCHMENT**

**AWANG NASRIZAL BIN AWANG ALI**

Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Civil Engineering**

December 2011

## ABSTRACT

Damansara Catchment is flood prone and major problem for the dense populated region is the damages received during flood. High intensity rainfall of 104 mm/day on 26<sup>th</sup> February 2006 had affected several areas to be heavily inundated with losses up to RM 45 millions. Thus, there is a need to conduct a study. This project presents a 3D (three-dimensional) hydrodynamic flood simulation that utilizes GIS (Geographic Information Systems). A DEM (Digital Elevation Model) for Damansara Catchment was developed and integrated into InfoWorks River Simulation (IWRs) program. The model was calibrated and validated using the 26<sup>th</sup> February 2006, 21<sup>st</sup> March 2007 and 15<sup>th</sup> October 2008 flood event. The parameters involved in calibration are the CN (Curve Number), Manning's Roughness Coefficient ( $n$ ) and River Profiles Extension. In model reliability analysis, the ratio of Linear Regression,  $R^2$  was found to be hard to be calibrated, probably due to changes in river profiles. MWLA (Maximum Water Level Analysis) and RMSE (Root Mean Square Error) both show error less than 9.09% and 0.90% respectively, and in Chi-Square Test,  $p \geq 0.90$ , thus indicating that the difference between actual and simulated water level is not significant and that the model is satisfactory. Inundated areas such as TTDI Jaya are able to be identified from inundation map. An alternative natural retention pond, RP001 is proposed at the upper catchment of Kampung Melayu Subang through the utilization of existing terrain 'bowl'. With improvement on the catchments' soil cover, RP001 pond was simulated to be able to reduce both flood level and volume up to 2.90% and 4.10% respectively.

**Keywords:** Digital Elevation Model (DEM), Damansara River, flood inundation, InfoWorks River Simulation (IWRs) and model reliability analysis.

## ACKNOWLEDGEMENTS

In the name of Allah, Most Gracious, Most Merciful. All praises to the Almighty Allah, for giving me the strength and patience throughout completing this project.

I am grateful to have the support and motivation from many people throughout this study and would love to take this opportunity to thank all whom involved directly and indirectly. I would like to express my sincere gratitude to my respective supervisor, Professor Ir. Dr. Hjh. Junaidah Ariffin, for her endless advice in every stage of this study. Her technical guidance and knowledge has always been a motivating force and a delightful experience for me. The same also goes to my co-supervisor, Professor Ir. Dr. Ruslan Hassan. Special thanks to En. Hj. Desa Ali from Department of Surveying Science & Geomatics, UiTM Shah Alam for assisting in DEM development and also to the surveying team from UTHM, lead by Sr. Saifullizan Mohd. Bukhari for assisting in hydrographic surveying activities. Many thanks are also due to DID, NAHRIM and JUPEM for providing hydrology and DTM data with technical knowledge. Not to forget the Flood Marine Excellence Centre and Institute for Infrastructure Engineering and Sustainable Management, Faculty of Civil Engineering, UiTM Shah Alam for providing equipments.

My appreciation also goes to my precious family whom never failed to give in their love and prayers. Lastly, thanks to all my friends, for their sincere encouragement and my hope is that the final product of this project is a worthy reflection of all their supportive efforts. May Allah bless us all.

Awang Nasrizal Bin Awang Ali  
December 2011

## TABLE OF CONTENTS

	<b>Page</b>
TITLE PAGE	i
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	x
LIST OF FIGURES	xiv
LIST OF ABBREVIATIONS	xxii
LIST OF APPENDICES	xxiv

### **CHAPTER 1: INTRODUCTION**

1.1	Background of Study .....	01
1.2	Problem Statement .....	03
1.3	Objectives .....	04
1.4	Scope of Study .....	04
1.5	Limitations .....	05
1.6	Significance of Study .....	06
1.7	Study Area .....	07

### **CHAPTER 2: LITERATURE REVIEW**

2.1	Introduction .....	11
2.2	Anthropogenic Factors That Lead To Flooding .....	11
2.3	Tangible Losses Due to Flooding .....	13

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

Flood threat has been constantly discussed everywhere all around the world. The damages caused by floods such as the disruption of economic activity are a known fact. The government had spent millions to help the flood victims in the country every year (Abdullah, 2007). The allocated budget had increased by the year and therefore needs serious attention.

Shah Alam which is located within Damansara Catchment has its' own historical flooding records. The overflowing problem in Damansara River has caused the urban areas to be flooded frequently. Figure 1.1 shows the images of flooding events in Shah

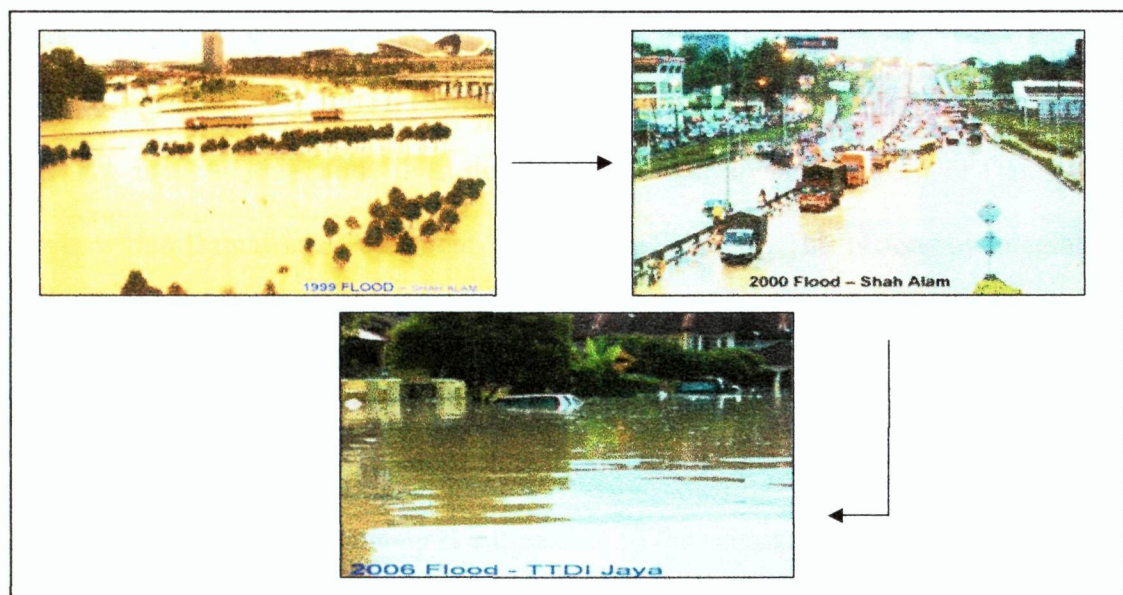


Figure 1.1: Historical floods disaster in Shah Alam. (Source DID, 2006a).