



Faculty of Engineering

**APPLICATION OF INFOWORKS MODELING FOR FLOOD MAPPING  
MAONG RIVER**

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Bachelor of Engineering with Honours  
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MAONG RIVER

**SESI PENGAJIAN: 2001 - 2006**

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TO MY BELOVED HUSBAND AND SON

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## **ABSTRAK**

InfoWorks Sistem Sungai (RS) Versi 5.0 ialah sebuah enjin simulasi alur terbuka yang berkuasa dan ia mampu mengawal barisan bentuk alur, saiz dan cerunan. Perkara utama dalam pembelajaran ini ialah mempergunakan InfoWorks Sistem Sungai (RS) Versi 5.0 bagi pemetaan kawasan banjir dalam Sungai Maong, satu daripada cabang Sungai Sarawak yang berparas rendah. Dua senario digunakan, di mana kawasan banjir lebih kepada banjir luar and air pasang daripada Sungai Sarawak dan satu lagi ialah kawasan banjir lebih kepada hujan di dalam kawasan basin. InfoWorks Sistem Sungai digabungkan dengan permohonan Sistem Maklumat Ilmu Alam (GIS) dalam pembelajaran ini untuk mendapatkan tindakbalas hidraulik pada Sungai Maong dan keadaan kawasan tanah rata sisi sungai. Maklumat diperlukan, persediaan, dan butiran rekabentuk yang hampir dibentang. Akhir sekali perbincangan dari projek menghasilkan cadangan untuk kegunaan masa akan datang diberi untuk membuat kesimpulan dalam projek ini.

## **ABSTRACT**

InfoWorks River System (RS) Version 5.0 is a powerful open channel simulation engine, and is able to handle a wide range of channel shapes, sizes and gradients. The main purpose of this study is to apply the InfoWorks River System (RS) Version 5.0, for mapping the flood area in Maong River, one of the tributaries of Lower Sarawak River. Two scenarios were applied, which are the flood area due to external flood and high tide from the Sarawak River and the other is the flood area due to internal storm in catchment. InfoWorks RS, coupled with its embedded Geographical Information System (GIS) application has been used in this study to capture the hydraulic response of the Maong River and its floodplains conditions. Data requirement, preparation, and details on modeling approach are presented. Finally, a discussion of the project limitation and recommendation for further application is given to conclude this project.



## Table of Contents

<b>Content</b>	<b>Page Number</b>
Acknowledgment	ii
Abstrak	iii
Abstract	iv
List of Tables	viii
List of Figures	ix
List of Appendix	xi
List of Abbreviations & Notations	xii
<b>Chapter 1 : Introduction</b>	
1.1 Background	1
1.2 Waterlevel	5
1.3 Objective	8
<b>Chapter 2 : Literature Review</b>	
2.1 Floodplain	9
2.2 Floodplain Hydrologic and Hydraulic Analysis	10
2.3 Rainoff-Runoff	11
2.3.1 Modified Rational Method	11
2.3.2 Time Area Method	12

2.4	Hydrodynamic Routing	14
2.4.1	Saint – Venant Equations	15
2.5	Hydrologic Routing	19
2.5.1	Lumped Reservoir Routing	20
2.5.2	Lumped River Routing	21
2.6	Application of Geographical Information System (GIS)	24
2.6.1	GIS-Based Hydrologic and Hydraulic Model	25

### **Chapter 3 : Methodology**

3.1	Introduction	27
3.2	Hydraulic Model Input Preparation	28
3.3	Model Building in InfoWorks	31
3.4	Boundary Condition	35
3.5	Model Result	37

### **Chapter 4 : Results and Discussions**

4.1	Results	38
4.2	Flood Depth	42
4.3	Flood Stage Hydrograph	53
4.4	Longitudinal Section	55
4.5	Flood Mapping	57
4.6	Discussions	60

**Chapter 5 : Conclusions and Recommendation**

5.1	Conclusions	61
5.2	Recommendations	62
	<b>References</b>	63
	<b>Appendix A</b>	66

## List of Tables

<b>Table</b>		<b>Page Number</b>
1.1	Characteristics of Maong River	4
1.2	Sarawak Hydrology Station Inventory	6
4.1	Data Flow in 24-Hour Storm	41
4.2	Length of Upstream to Downstream Node	55

## List of Figures

<b>Figures</b>		<b>Page Number</b>
1.1	The Maong River Catchment Location Plan	2
1.2	Maong River Catchment – Subcatchment	3
1.3	Hydrological Station at Maong River	7
2.1	Natural levees form on its banks.	10
2.2	Time- Area Method	14
2.3	Development of the storage-outflow function	21
3.1	Projected Digital Map of Maong River Using ESRI ArcView	29
3.2	TIN Surface Model of Maong River Using ESRI ArcView 3D-Analyst Extension v1.0	30
3.3	Viewing of Digital Terrain Model of Maong River Using GeoPlan of Infoworks RS	32
3.4	Viewing of Maong River Network Using Geoplan of Infoworks RS	33
3.5	Viewing the Section Data of Maong Main 1b	34
3.6	Property Sheet-Flow Time Boundary of Central Park	36
3.7	Property Sheet-Stage Time Boundary of Maong Mouth	37
4.1	Water Level Data Hydrograph at Maong Mouth (Jan 21 & 22, 2000)	39
4.2	Water Level Data Hydrograph at Maong Mouth (Jan 1 & 2, 2000)	39
4.3	100 Years Flood Hydrograph For Maong River As Estimated by D.I.D	40
4.4 (a)	Maong Kanan 3 Cross Section (Jan 22, 2000)	43
4.4 (b)	Desa Wira A Cross Section (Jan 22, 2000)	43
4.4 (c)	Maong Kanan 5 Cross Section (Jan 22, 2000)	44
4.4 (d)	Central Park A Cross Section (Jan 22, 2000)	44
4.4 (e)	Maong Tengah Kiri Cross Section (Jan 22, 2000)	45

4.4 (f)	Maong Main 2 Cross Section (Jan 22, 2000)	45
4.5 (a)	Maong Kanan 3 Cross Section (Jan 1, 2000)	46
4.5 (b)	Desa Wira A Cross Section (Jan 1, 2000)	46
4.5 (c)	Maong Kanan 5 Cross Section (Jan 1, 2000)	47
4.5 (d)	Central Park A Cross Section (Jan 1, 2000)	47
4.5 (e)	Maong Tengah Kiri Cross Section (Jan 1, 2000)	48
4.5 (f)	Maong Main 2 Cross Section (Jan 1, 2000)	48
4.6	Minimum Inundation Area At Beginning of Strom for 1 <sup>st</sup> Scenarios (Jan 21-22, 2000)	49
4.7	Maximum Inundation Area for 1 <sup>st</sup> Scenarios (Jan 21-22, 2000)	50
4.8	Minimum Inundation Area At Beginning of Strom for 2 <sup>nd</sup> Scenarios (Jan 1-2, 2000)	51
4.9	Maximum Inundation Area for 2 <sup>nd</sup> Scenarios (Jan 1-2, 2000)	52
4.10	Flood Stage Hydrograph at Central Park for 1 <sup>st</sup> Scenarios (Jan 1-2, 2000)	53
4.11	Flood Stage Hydrograph at Central Park for 2 <sup>nd</sup> Scenarios (Jan 1-2, 2000)	54
4.12	Flood Longitudinal Section at Maong Main For 1 <sup>st</sup> Scenarios (Jan 1-2, 2000)	56
4.13	Flood Longitudinal Section at Maong Main For 2 <sup>nd</sup> Scenarios (Jan 1-2, 2000)	56
4.14	1 <sup>st</sup> Scenarios Flood Map on January 21-22, 2000	58
4.15	2 <sup>nd</sup> Scenarios Flood Map on January 1-2, 2000	59

## List of Appendices

Appendix	Page Number
A Hydrological Data : Water Level	65

## **List of Abbreviations & Notations**

3-D	Three-Dimensional
$\Delta t$	Time Step
A	Area in km <sup>2</sup>
AutoCAD	Automatic Computer Aided Design
DEM	Digital Elevation Model
D.I.D Sarawak	Department of Irrigation & Drainage Sarawak
DTM	digital Terrain Model
DUFlow	Dutch Flow, a licensed hydraulic modeling software
ESRI	Environmental sciences Research Institute
ESRI ArcView	A GIS software package of ESRI
GeoPlan	Geographical Plan, a GIS tool of InfoWorks RS
GIS	Geographical Information System
Hr	Hour
HEC	Hydrologic Engineering Centre
HEC-2	A modeling software package of HEC
HEC-RAS	River Analysis System, a modeling software package of HEC
HSPF	Hydrologic Simulation Program – Fortran
InfoWorks	A licensed hydraulic modeling software of Wallingford Software Ltd. UK
InfoWorks RS	River System, a modeling software package of InfoWorks



ISIS	A licensed hydraulic modeling software of Wallingford Software Ltd. UK
m AD	Elevation Level Above Datum
m LSD	Elevation Level of Standard Design
m M.S.L	Mean Sea Level
NREB	Natural Resources Environmental Board
TIN	Triangular Irregular Network
Q	Discharge in m <sup>3</sup> /s

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This project is submitted in partial fulfillment of the requirement for the  
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Faculty of Engineering  
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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The Maong River confluence with the Sarawak River about 37km from the river mouth. Maong River is one of the tributaries of Sarawak River. It has 2 tributaries, namely Maong Kiri River and Maong Kanan River. Table 1.1 shows the Characteristics of Maong River. The area coverage is approximately 47km<sup>2</sup> catering for about 73,000 people. The Maong River Catchment Location Plan is shown in Figure 1.1. The main river serves 1 subcatchment, comprised of mainly undeveloped land on both sides of the river. Maong Kiri serves the eastern position of the Maong River Catchment and 41 urbanised subcatchments comprising mainly residential and commercial establishments whereas Maong Kanan River serves the western portion and 9 subcatchments, which are mainly residential (Desa Wira) and undeveloped lands except the Proposed Muda Jaya City Development at Batu Kawa. There are 3 main roads across it, Batu Kawa Road, Kung Phin Road and Semaba Road (See Figure 1.2).

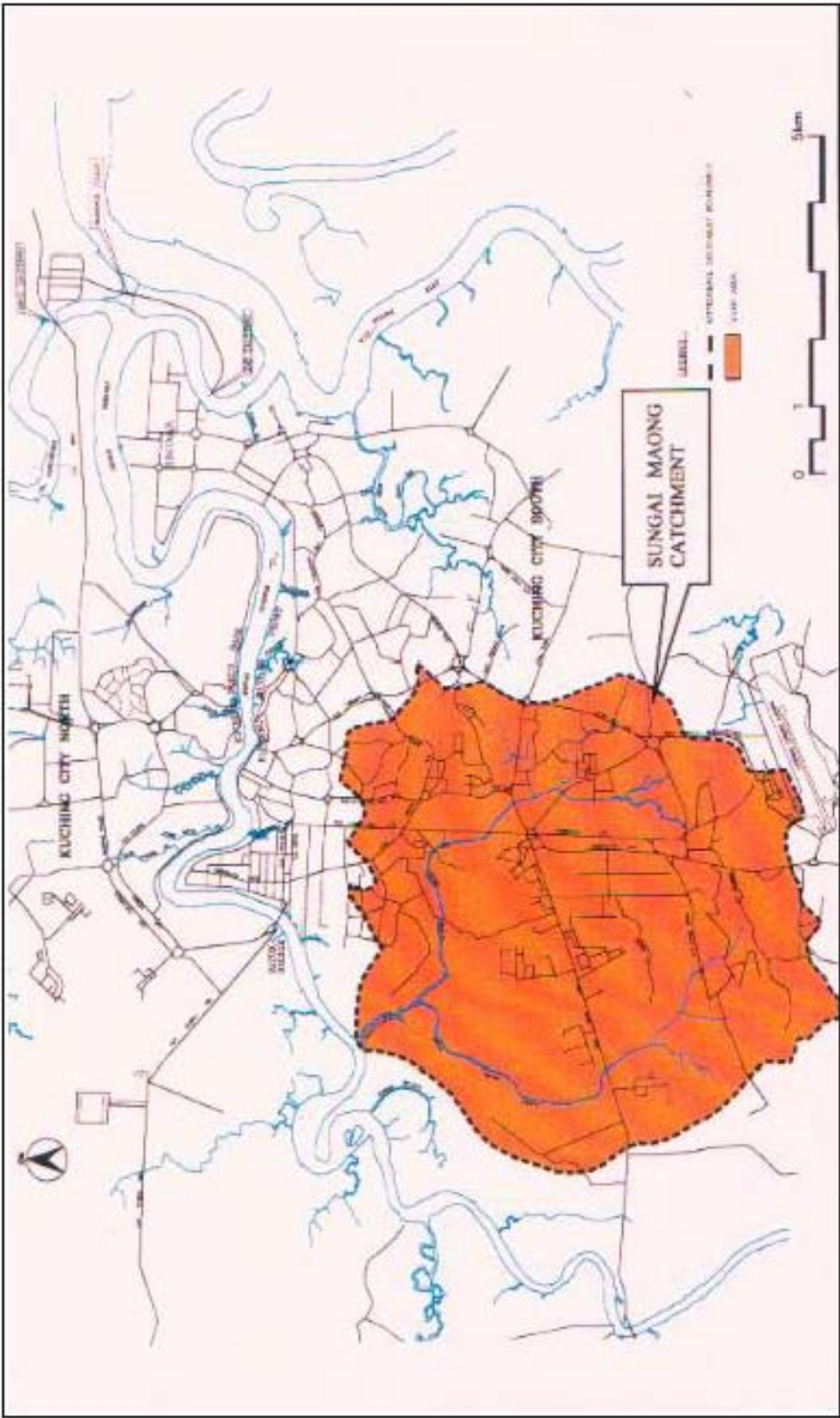




Figure 1.2 Maong River Catchment – Subcatchment  
 ( Source : Department of Irrigation & Drainage Sarawak)

Table 1.1 Characteristics of Maong River

Name of River	Catchment Area (Km <sup>2</sup> )	Length of River (Km)
Maong Kiri River	19.94	8.3
(at 3 <sup>rd</sup> Mile Bridge)	10.55	
Maong Kanan River	19.05	7.5
(at Batu Kawa Road Bridge)	12.20	

( Source : Department of Irrigation & Drainage Sarawak)

The existing Maong River is effected by many problems, including flash flooding, poor water quality, poor river aesthetics and perceived by the general public as a waste dumping conduit. It heavily polluted by organic matter. BOD levels and ammoniacal nitrogen concentrations are very high and the oxygen conditions are extremely poor (NREB 2002).

Maong River is located upstream of Sarawak River Barrage, so it is influenced by the Barrage and the operation of the gate. According to the Drainage and Irrigation Department contoured Topographical Plan, the major part of the Maong River Catchment is low-lying and flat with ground levels generally range from below 2.5 mLSD to 5.0 mLSD. Hilly terrain occurs at the north eastern and southern part of the catchment with ground levels range from 7.5 mLSD to 20 mLSD. With reference to the operation of the Sarawak River Barrage which allow high tide to

enter Sarawak River within the regulated water level of 1.4 mLSD, those areas that are below 2.5 mLSD are susceptible to flooding from either tidal events, rainfall events or a combination of both. Areas that have ground level between 2.5 mLSD to 5.0 mLSD will not be flooded regularly after control by the Barrage but may be subject to flooding from backwater effect of the inadequate waterway section and high water level at the drainage outlet.

## **1.2 Water Level**

Table 1.2 Sarawak Hydrology Station Inventory shows four waterlevel stations were installed to facilitate a detail investigation into the local tidal phenomena at Maong River. Four automatic water level are situated at the Central Park Station at the Maong Kiri River and Maong Kuala Station at the mouth of the Maong River. The other water level station are Maong Tengah Kiri Station at the Maong Kiri River and Desa Wira Station at the Maong Kanan River. Figure 1.3 is show the location of hydrological station. The first installation of automatic water level for Central Park Station was in November 4, 1995, Maong Kuala Station and Maong Tengah Kiri Station were in April 4,1996 and Desa Wira Station was in May 25, 1996. Before that all the station were using manual water level. For the Ulu Maong Station located at the Hui Sing was stop operation since 1997 because too many missing data. Their immediate function is to confirm the extent and duration

of inundation and flooding. The water level data for the month of January 2000, for all the stations are given in Appendix A.

There are two different types of flood in the Maong River Area i.e. internal floods and external floods. Internal floods are observed everywhere in the catchment after heavy rainfalls during the landas season. They are caused mainly by the fact that the existing channel is too small and meandering and cannot accommodate the runoff from high intensity storms. External floods are caused by high flood water and high tides from Sarawak River. The king tide levels when coupled with high intensity rainfall will flood some of the low-lying areas. The most critical condition arises when both king tides and flood water from upper tributaries reach a place at the same time. This had happens at the lower reaches of the Maong River.

Table 1.2 Sarawak Hydrology Station Inventory

River Station : Water Level & Discharge					
Station Name	River Name	Station Number	Type of Gauge	B.M Value: TBM:	Zero of Gauge
Maong Kuala	Maong	1502435	Recorder	2.87 m M.S.L	-2.195 m M.S.L
Maong Tengah Kiri	Maong Kiri	1503446	Recorder		
Central Park	Maong Kiri	1503434	Recorder	4.445 m M.S.L	-0.130 M.S.L
Desa Wira	Maong Kanan	1502402	Recorder	3.104 m M.S.L	-0.782 m M.S.L

( Source : Department of Irrigation & Drainage Sarawak)