

DETERMINATION OF THE RIVER FLOW IN THE KERTEH RIVER  
CATCHMENT AREA FROM GIS TECHNOLOGY

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2012



**DETERMINATION OF THE RIVER FLOW IN THE KERTEH RIVER  
CATCHMENT AREA FROM GIS TECHNOLOGY**

**By**

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**Research Report submitted in partial fulfillment of  
the requirement for the degree of  
Bachelor of Science (Marine Science)**

**Department of Marine Science  
Faculty of Maritime Studies and Marine Science  
UNIVERSITI MALAYSIA TERENGGANU**

**2012**

This project should be cited as:

Amirah, R. 2012. Determination of the river flow simulation in Kerteh River catchment area from GIS Technology. Undergraduate thesis, Bachelor of Science In Marine Science, Faculty of Maritime and Marine Science, Universiti Malaysia Terengganu, Terengganu, 99p

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**DEPARTMENT OF MARINE SCIENCE  
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE  
UNIVERSITI MALAYSIA TERENGGANU**

**DECLARATION AND VERIFICATION FORM  
FINAL YEAR RESEARCH PROJECT**

It is hereby declared and verified that this research report entitled:

Determination of the River Flow Simulation at Kerteh River Catchment Area Using From GIS Technology by Amirah Binti Ruslan, Matric No. UK20449 has been examined and all errors identified have been corrected. This report is submitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of Bachelor of Science (Marine Science), Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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## **ACKNOWLEDGEMENT**

Firstly, I'm grateful that my supervisor, Dr Razak Zakariya gave me such an interesting project to do. I'm very thankful for his guidance, knowledge and advices that helped me to complete my final year project in Universiti Malaysia Terengganu.

I would like to express my gratitude to all the Laboratory of Remote Sensing and GIS staff's : Encik Wan Roshairry and Encik Yuzwan for assistance and permissions for using the lab to help complete my project. Special thanks to Encik Muhammad Taufiq for his guidance and knowledge in teaching me to use the SWAT software. Without him, I may not be able to complete the project.

My gratitude also goes to Ethylene Polyethylene Malaysia Sdn Bhd for their sponsor for food, accommodation and others during my sampling days in Sungai Kerteh, Terengganu. Not forgettable, my gratitude also goes to Drainage and Irrigation Department of Malaysia and Malaysia Meteorological Department for providing the data for my project.

And finally, special thanks to my family, friends, and my roommate, Nur Aisyah Binti Abdul Rahman for her support that helped me to complete my project and studies.

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## LIST OF ABBREVIATIONS

AVSWAT	- Arc View Soil and Water Assessment Tool
CN	- Curve Number
DEM	- Digital Elevation Model
$E_{NS}$	- Nash-Sutcliffe coefficient
ET	- Evapotranspiration
GCP	- Ground Control Point
GIS	- Geographic Information System
GPS	- Global Positioning System
GPP	- Gas Processing Plant
HRU	- Hydrological Response Unit
$km^2$	- Kilometer square
$m^3/s$	- Meter cubic per second
m/s	- Meter per second
MUSLE	- Modified Universal Loss Soil Equation
$R^2$	- Coefficient of determination
RMSE	- Root mean square error
RSR	- Ratio of RMSE & standard deviation observed data
SPOT-5 (satellite)	- Système Pour l'Observation de la Terre-5
SWAT	- Soil and Water Assessment Tool
US	- United States
USLE	- Universal Loss Soil Equation
USGS	- United States Geological Survey



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## ABSTRACT

The Soil and Water Assessment Tool (SWAT) has been used to predict upcoming 20 years river flow at the Kerteh River catchment area. The Kerteh River catchment area, was located at the Kemaman district and the river was near to the base operation of petroleum processing in Malaysia. Kerteh River was flow to the South China Sea and thus, sometimes the river flow was affected by tides. Kerteh river was exposed to the Northeast Monsoon, on November until March. This catchment area has the area approximately 27,000 hectares. 28 sub basin was created by using AVSWAT and only two sub basin was used in this study which was sub basin 13 (Station 1) and sub basin 28 (Station 2). This model has been evaluated by using the Nash-Sutcliffe efficiency value,  $E_{NS}$ , Root mean square error (RMSE), coefficient of determination,  $R^2$  and RSR, ratio of the RMSE and standard deviation observed data. The value for  $R^2$  for are 0.82. For  $E_{NS}$ , the value obtained are 0.98 which is, classified as excellent value. Value for RMSE and RSR is 0.56 and 0.44, which is very good value. 11 years of weather data (2000-2011) has been used in this study. Overall, the results indicated that the SWAT model can be an effective tool for prediction the river flow

# **SIMULASI ALIRAN SUNGAI DI KAWASAN TADAHAN SUNGAI KERTEH DARIPADA TEKNOLOGI GIS**

## **ABSTRAK**

Soil and Water Assessment Tool (SWAT) telah digunakan untuk meramal aliran sungai di kawasan tadahan Sungai Kerteh. Kawasan tadahan Sungai Kerteh terletak di daerah Kemaman dan sungai ini juga terletak berdekatan dengan pusat operasi pemprosesan petroleum di Malaysia. Sungai Kerteh mengalir ke Laut China Selatan dan kadangkala, bacaan kelajuan aliran sungai dipengaruhi oleh pasang surut laut. Sungai Kerteh juga terdedah kepada monsoon timur laut yang berlaku dari November hingga Mac. Kawasan tadahan Sungai Kerteh mempunyai luas kawasan sebanyak 27,000 hektar. 28 sub-tadahan telah dihasilkan dengan menggunakan perisian AVSWAT dan hanya sub-tadahan 13 dan sub-tadahan 28 digunakan untuk kajian ini. Model ini telah diuji dan dinilai dengan menggunakan nilai kecekapan Nash-Sutcliffe,  $E_{NS}$ , RMSE, pekali penentuan,  $R^2$ , dan RSR, nisbah RMSE dan sisihan piawai data pemerhatian. Nilai untuk  $R^2$  ialah 0.82. Untuk  $E_{NS}$ , nilai yang diperolehi adalah 0.98 iaitu diklasifikasikan sebagai cemerlang. Nilai untuk RMSE dan RSR ialah 0.56 dan 0.44, iaitu nilai sangat baik. 11 tahun data cuaca (2000-2011) telah digunakan dalam kajian ini. Secara rumusannya, keputusan menunjukkan model SWAT boleh dijadikan model efektif untuk meramal kelajuan aliran sungai.