



RIVER CONSERVATION AND REHABILITATION: MUDA RIVER

Prof. Pierre Julien visited the Nibong Tebal Campus of USM on May 16-19, 2006. It is already the fourth visit of Dr. Julien since 2002, and he prides himself for saying a few words in Bahasa Melayu. The collaboration between REDAC and Colorado State University is expanding very rapidly. The current joint development initiative is linked to the flood mitigation plan of the Muda River.

The Muda River (Sg. Muda) has caused significant flood damages in the past 20 years, particularly during three large rainstorms in 1988, 1998 and 2003. The flood of Sg. Muda in 2003 prompted the Department of Irrigation and Drainage in Malaysia to develop a flood mitigation plan. Dr. Julien says that the flood mitigation plan is very important for the State of Kedah. It will significantly reduce the risk of future flood damages from Sg. Muda and protect residents from devastating floods. During his visit, Dr. Julien provided expertise in river engineering for the preparation of an inception report on the design options of the flood mitigation plan. The main purpose of this flood mitigation plan is to ensure that the proposed design will be effective, environmentally sound and economical. Detailed hydrological and river modeling studies are undertaken at REDAC to meet the objectives of this study.

Prof. Julien also participated in the 2006 Postgraduate Seminar at REDAC on May 17th. He provided discussion comments on the research results of three graduate students, namely by Mr. Jalil Hasan, Mr. Asnol Adzhan Manap and Mr. Joseph Dinor. During his visit, he has interacted with several faculty and graduate students at REDAC. The following photos show Dr. Julien with Dr. Aminuddin Ab Ghani during his visit to USM campus, at the REDAC postgraduate seminar, and with Drs. Nor Azazi Zakaria and Rozi Abdullah during a site visit to Sg. Muda. *Prepared by: Prof. P. Y. Julien, Colorado State University, USA. pierre@eng.colostate.edu*

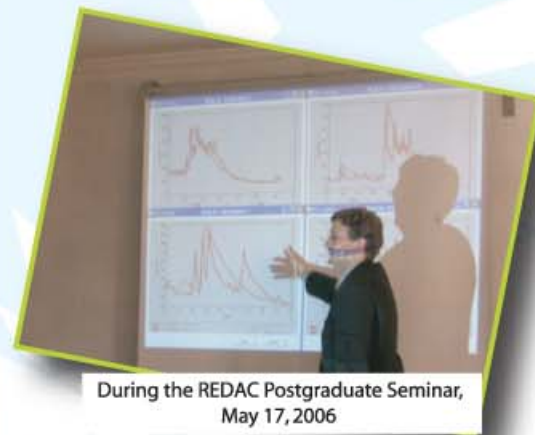
Prof. P. Y. Julien, Colorado State University, USA



With Assoc. Prof. Dr. Ab Ghani at the BIOECODS Pilot Project on USM Engineering Campus, May 17, 2006



At the BIOECODS Wetland on USM Engineering Campus, May 17, 2006



During the REDAC Postgraduate Seminar, May 17, 2006



With Prof. Zakaria near the Merdeka Bridge crossing Sg. Muda, May 18, 2006



With Assoc. Prof. Dr. Rozi Abdullah at the Sg. Muda Barrage under construction, May 18, 2006



With RedMax engineers during the construction of the Muda Barrage on Sg. Muda, May 18, 2006



By Prof. Nor Azazi Zakaria, REDAC Director

FOREWORD

The Prime Minister of Malaysia launched the Ninth Malaysia Plan (2006-2010) in March 2006. One of the main issues to be dealt with is the Environment. The Prime Minister reveals that more and more rivers in Malaysia are becoming polluted and as a result, more investment is needed to rehabilitate the rivers to their pristine natural condition. REDAC has been at the forefront on **River Conservation and Rehabilitation** since its inception in May 2001. With its close working relationship with the Department of Irrigation and Drainage (DID) Malaysia, REDAC is working hard to help Malaysia achieve the Ninth Malaysia Plan in particular with regards to the river environment.

REDAC is presently working on the Muda River Rehabilitation project to solve the flooding problems in the Muda River catchment which has experienced three major floods in the past 15 years (1988, 1998, 2003). With the launching of the **National River Health Programme** under **One River One State Programme** by DID, REDAC hopes that the rivers in Malaysia will be able to sustain their pristine natural condition as Malaysia progresses toward a developed nation in 2020.

REDAC is organizing the 2nd International Conference on Managing Rivers in the 21st Century (**Rivers'07™**) in June 2007 at Kuching, Sarawak. With the theme "**Solutions towards Sustainable River Basins**", REDAC welcomes all researchers, engineers, and NGOs to present their ideas towards achieving a sustainable river basin during the conference. Six distinguished Keynote Speakers have been identified to present their expertise covering aspects of Integrated River Basin Management, Flood Risk Management, Water Quality Treatment, Stream Heritage, Sustainable Urban Drainage System (SUDS) and Inland Water Transport.

Meanwhile the Bio-Ecological Drainage System (**BIOECODS**) project continuously receives visitors from overseas and local institutions. REDAC welcomes all who would like to experience the outcome of the pilot project on SUDS by visiting us at the USM Engineering Campus. REDAC hopes that by looking at the components of BIOECODS, the visitors will apply the system to help our river environment remain healthy.

Potential postgraduate research students are encouraged to do their study at REDAC on the subjects of **River Management** and **SUDS**. An abstract on a recently published article in the **Journal of Hydraulic Engineering**, American Society of Civil Engineers (**ASCE**) is included in this Bulletin that highlights the on-going research on sediment transport in Malaysian rivers which has been conducted since 1994. Flood mapping is another important topic with flooding occurrence continuing to rise in recent years. An example of river modelling with the GIS application for the case of the Selangor River, illustrating the suitability of the chosen model in the generation of the flood risk map, was presented in the recent ASIA GIS conference in March 2006. Examples of recent postgraduate works at REDAC are also included herein for the benefit of potential new research works.

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MULTIPLE LINEAR REGRESSION MODEL FOR TOTAL BED MATERIAL LOAD PREDICTION

SHANKER KUMAR SINNAKAUDAN, AMINUDDIN AB. GHANI, MOHD SANUSI S. AHMAD, NOR AZAZI ZAKARIA

Journal of Hydraulic Engineering, American Society of Civil Engineers (ASCE). Vol. 132, No. 5, pp. 521-528, May 2006

Abstract

A new total bed material load equation that is applicable for rivers in Malaysia was developed using multiple linear regression analyses. A total of 346 hydraulic and sediment data were collected from nine natural and channelized rivers having diverse catchment characteristics in Malaysia. The governing parameters were carefully selected based on literature survey and field experiments, examined and grouped into five categories namely mobility, transport, sediment, shape, and flow resistance parameters. The most influential parameters from each group were selected by using all possible regression model method. The suitable model selection criteria namely the R-square, adjusted R-square, mean square error, and Mallow's Cp statistics were employed. The accuracy of the derived model is determined using the discrepancy ratio, which is a ratio of the calculated values to the measured values. The best performing models that give the highest percentage of prediction from the validation data were chosen. In general, the newly derived model is best suited for rivers with uniform sediment size distribution with a d50 value within the range of 0.37–4.0 mm and performs better than the commonly used Graf, Yang, and Ackers–White total bed material load equations.

DOI: 10.1061/(ASCE)0733-9429(2006)132:5(521)

CE Database subject headings: Sediment transport; Rivers; Regression models; Sediment load; Predictions; Bed materials.

DEVELOPMENT OF FLOOD RISK MAP USING GIS FOR SG. SELANGOR BASIN

ABD JALIL HASSAN, AMINUDDIN AB. GHANI, ROZI ABDULLAH

6th International Conference on ASIA GIS, 9th-10th Mac 2006, Universiti Teknologi Malaysia

Abstract

Flood is a natural disaster in this country. However human activities in many circumstances change flood behaviour. Activities in the flood plain and catchment such as land clearing for urbanisation or agriculture, construction of infrastructures such as highway and road and bridges in the flood plain may increase the magnitude of flood which increases the damage to the properties and life. The behavior of flood due to flood mitigation project such as river widening and straightening must well be understood since this kind of work may transfer the flood problem form upstream to the downstream part of the river. At present, one of the ways to study and understand the flood behaviour is by generating the flood extent or flood risk map. A hydraulic modeling especially computer model is required to carry out the flood simulation to produce flood level at various location along the river and flood plain. However, to analyse a river system requires tremendous amount of data such as rainfall distribution, river properties and most important the flood plain topography. GIS software is able to handle the processing of such problem as and input to the hydraulic model. The output of the hydraulic simulation can be transferred to GIS software to generate flood layer for various scenarios. Further analysis such as flood damage assessment can be carried out for planning and design purpose. The combination of GIS software and hydraulic software able to speed up the process of producing flood risk map which is suitable for a decision support system.

This paper presented the work carried out in Sg. Selangor basin in the use of GIS tools from development of hydrological model, hydrodynamic model, 3D ground model and generation of flood risk map.

Keyword: GIS, Triangulation Irregular Network, flood, Hydrodynamic modelling, flood plain , flood risk map, InfoWorks RS



Name
Mahadzir Kassim (MSc Candidate)

Project Title
Sediment Deposition in a Rigid Monsoon Drain: A Case Study of Raja River, Alor Setar

Supervisors
1. Assoc. Prof. Dr. Aminuddin Ab. Ghani 2. Prof. Dr. Nor Azazi Zakaria

Present Status
Completed (October 2005)

INTRODUCTION

The existing conventional drainage system in cities throughout Malaysia is built mainly to cater for the increase in surface runoff due to rapid development that occurs in the city borders. The drainage system is normally made up of open rigid concrete drains susceptible to maintenance problems such as sediment deposition, litter, and utility pipes crossing and blocking the waterways.

The present study conducted field data collection of sediment deposition along Raja River drainage system to identify the trend of sediment depositions. Assessment of the existing incipient motion criteria was also made to identify the equation that is able to predict the sediment deposition trend in the River Raja drainage system.

STUDY AREA

The Raja drainage catchment is part of the Alor Star Town Drainage scheme, Phase 1 (Figure 1). The scheme comprises three catchment basins (Raja, Langgar & Putera) with a total catchment area of 300 ha and was proposed as part of a flood alleviation programme for the region. The Raja basin is the largest in the area (233 ha) and is also the most prone to problems of flooding.

The area receives an annual rainfall of 2500 mm. Flows from the Raja basin are drained by gravity to a pump station before being discharged via pumping mains to the Sungai Kedah waterway.

The main lengths of the drainage system take the form of trapezoidal /rectangular, open channel sections. The sections are lined in concrete, vary in width from 4 to 16m and have been designed to a minimum velocity criterion of 0.9 m/s for the purpose of sediment self-cleansing.

METHODOLOGY

Measurement of sediment deposition (Ab. Ghani et al., 2000) were made at ten stations during 2000 -2001 period along Alor Derga and Alor Siam forming the upstream branches Raja River and the main reach of the Raja River (Figure 1). For each station, the thickness of sediment deposits along the channel was measured over a 20-metre distance at an interval of 1m spacing. For each interval, three measurements of sediment thickness were made (Figure 2). Samples of sediment were also collected during the measurement of sediment profiles (Figure 3 and Figure 4).

An example of sediment profile for Station 1 measured on 10th June 2000 is given in Figure 5. The average sediment profile with a slope of 0.0008 as compared to the main channel slope of 0.0004 is given in Figure 6. Sediment deposition trend at all ten stations during the sediment data collection period is given in Figure 4 (Kassim et al., 2004).

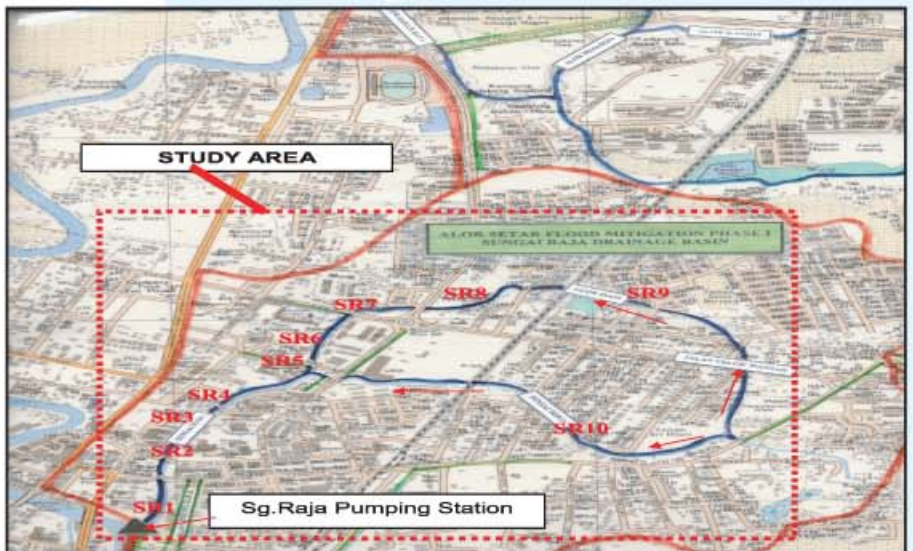


Figure 1 Raja River Drainage System, Alor Star

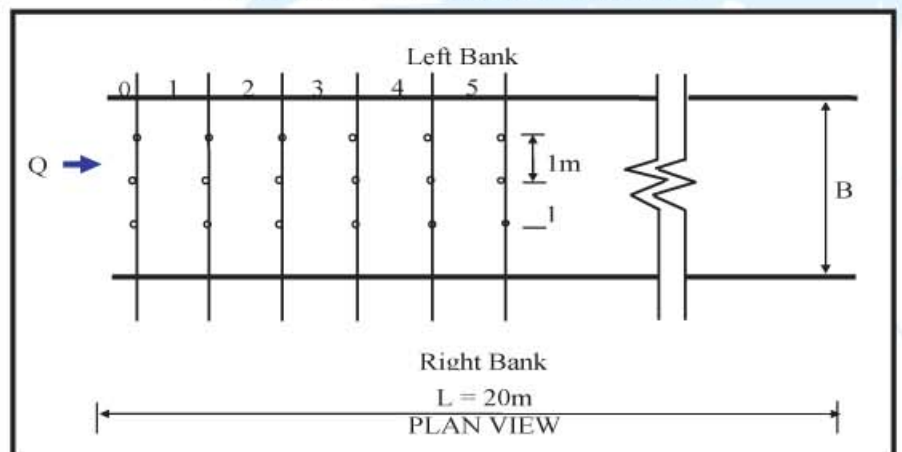


Figure 2 Sediment Profile Measurement Points at a Section

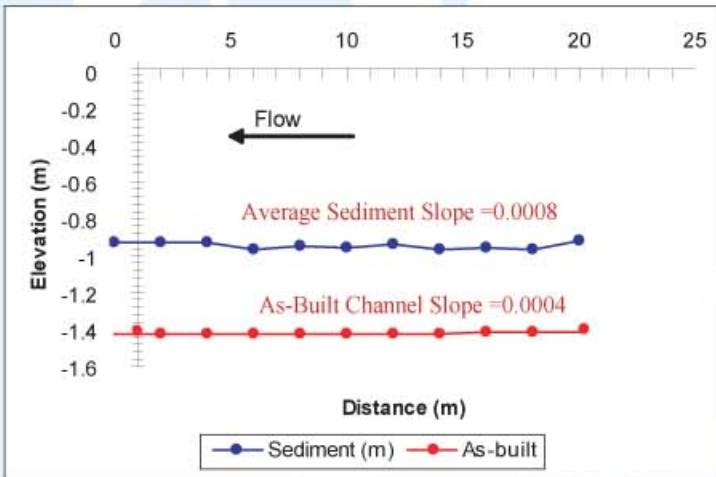
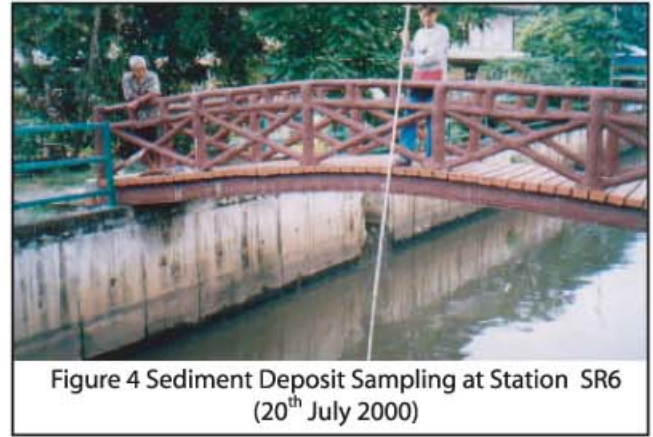
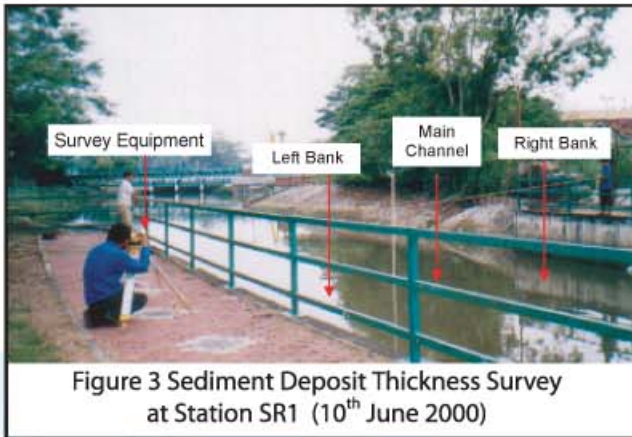


Figure 5 Average Sediment Deposition Profile for Station 1 on 10th June 2000 (Kassim et al., 2004)

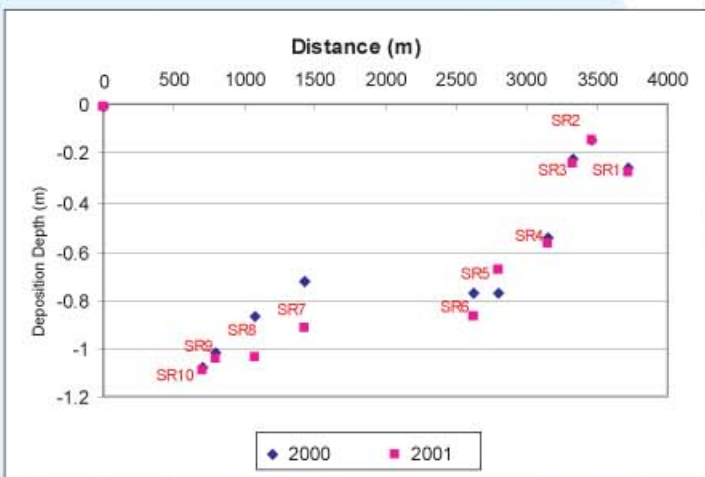


Figure 6 Sediment Deposition Trend at All Stations (Kassim, 2005)

RESULTS

The self-cleansing approach in terms of either minimum velocity (V_c) or shear stress (τ_c) is usually used to minimize sediment problems in urban drainage systems. The application of this approach is meant to avoid any deposition at any time or at least over a long period of time no deposits will build up (i.e. high flows flush the deposits). Several available incipient motion criteria namely Novak & Nalluri (1975), Ojo (1978), Novak & Nalluri (1984), El-Zaemey (1991) and Ab. Ghani et al. (1999) were used to predict sediment deposition along the Raja River channel.

The results show that the deposited sediment deposition can be predicted satisfactorily using equations by Novak & Nalluri (1975), El-Zaemey (1991) and Ab. Ghani et al. (1999). Detailed analysis can be found in Ab. Ghani et al. (2006).

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**Name****Asnol Adzhan Abd. Manap (MSc. Candidate) (wev6516@yahoo.com)****Project Title****Hydrologic and Hydraulic Modeling Analysis of the Detention Ponds for Stormwater Management Application****Supervisors****1. Assoc. Prof. Dr. Aminuddin Ab. Ghani****2. Prof. Nor Azazi Zakaria****Present Status****On-Going (1 August 2005 – 31 Julai 2007)****INTRODUCTION**

The traditional approach in stormwater management shifted during the 1970s to a storage approach with a focus on detention, retention and recharge. Subsequently, the Department of Irrigation and Drainage (DID) of Malaysia had produced a new urban drainage manual, known as Stormwater Management Manual or SWMM, which has been effectively used since 1st January 2001. Thereafter, approval for all federal, state and private development will depend on compliance with these new guidelines. These new guidelines require the developers to apply Best Management Practices (BMPs) to control stormwater quantity and quality to achieve Zero Development Impact Contribution. Department of Irrigation and Drainage and Universiti Sains Malaysia have embarked on pilot project that meets the requirements of the Stormwater Management Manual for Malaysia, known as the Bio-Ecological Drainage System, BIOECODS which has been constructed at the Engineering Campus of the Universiti Sains Malaysia, Nibong Tebal, Penang.

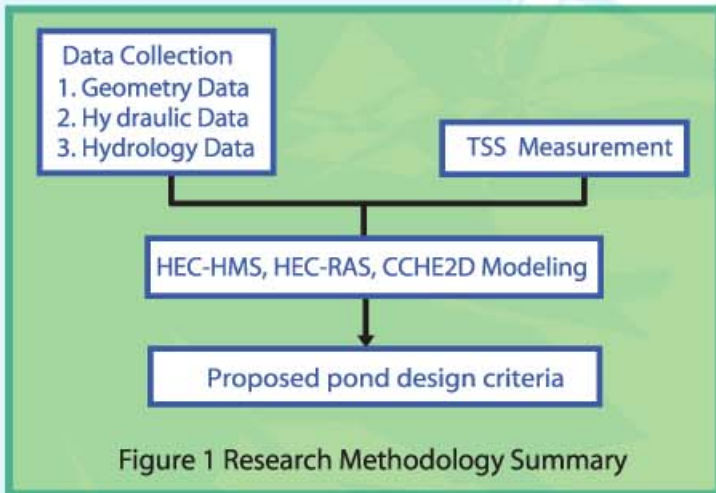
STUDY OBJECTIVES

This study is carried out at the BIOECODS project site with focuses on ecological pond components (i.e. a wet pond, a detention pond, a constructed wetland, a wading stream and a recreational pond) to analyse the effectiveness of ponds in SWMM application. The results from HEC-HMS, HEC-RAS and CCHE2D modeling will be used to enhance and support SWMM application in Malaysia.

**Wet Pond****Detention Pond****METHODOLOGY**

As shown in figure 1, the available data are from the previous studies (Ainan 2003, DID 2004, Mohd Sidek 2005, DID 2006) includes pond survey geometry data, land use data, hydraulic and hydrology data. These data together with those from the present study up to 2006 will be calibrated and validated with the present condition and used to study pond effectiveness. This will allow evaluation of ponds over a 6 - year period by considering the effect of cross section and outlet structure of ponds.

RESEARCH



ArcView GIS will be used to change pond survey geometry data (including spot level) to DEM and TIN format for easy editing and data entry. Mathematical models, HEC-HMS can be used to develop the inflow hydrograph (hydrologic analysis) while HEC-RAS and CCHE2D are used to analyse the hydraulic of the pond and the Total Suspended Solid (TSS) for a given flow period. In order to study the effectiveness of ponds, selected observed rain event and design ARI (using latest IDF curve) to be tested and compared with the observed data.

EXPECTED RESULTS

The calibration and validation results of HEC-HMS, HEC-RAS and CCHE2D will be used to predict ponds capability up to

100-year peak flood discharge for existing and expected future land use. Suggestions on pond design then can be made based on the modeling results.

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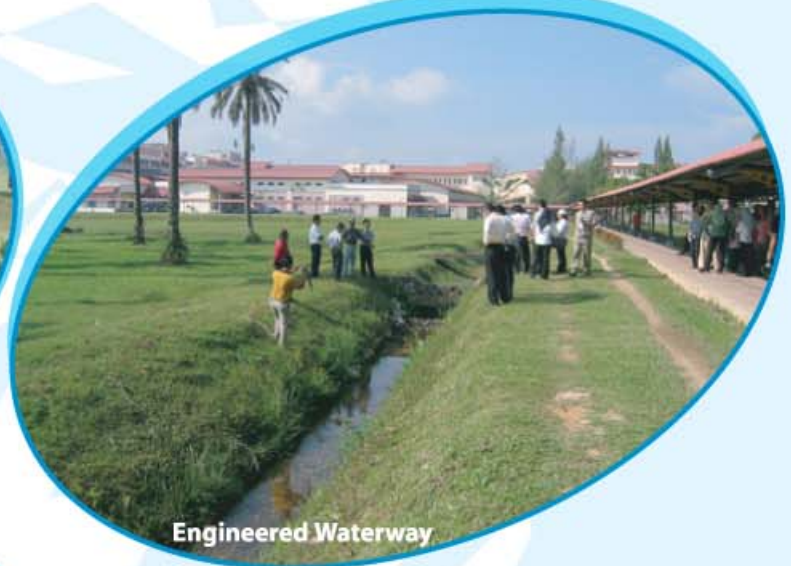
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NATIONAL SEMINAR

Water Resources & Environment: Application of Nuclear & Related Technologies

3rd - 5th April, 2006 Bukit Merah Laketown Resort

The Department of Irrigation and Drainage (DID) of Malaysia and Malaysian Institute for Nuclear Technology (MINT) have conducted a national seminar to disseminate their joint research outputs related to nuclear technology. A technical visit to BIOECODS project was carried out on the second day of the seminar.



NATIONAL SEMINAR





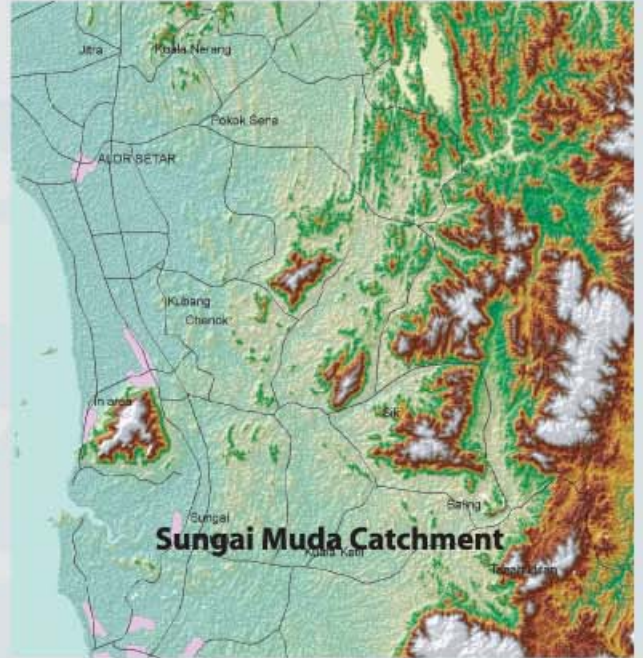
Project Title : DESIGN OPTION OF THE FLOOD MITIGATION PLAN OF SG. MUDA, SUNGAI MUDA, KEDAH

Client : Department of Irrigation and Drainage (DID) Malaysia

Period : April - September 2006



Study Area : Sungai Muda Lower Reach



New Barrage Under Construction



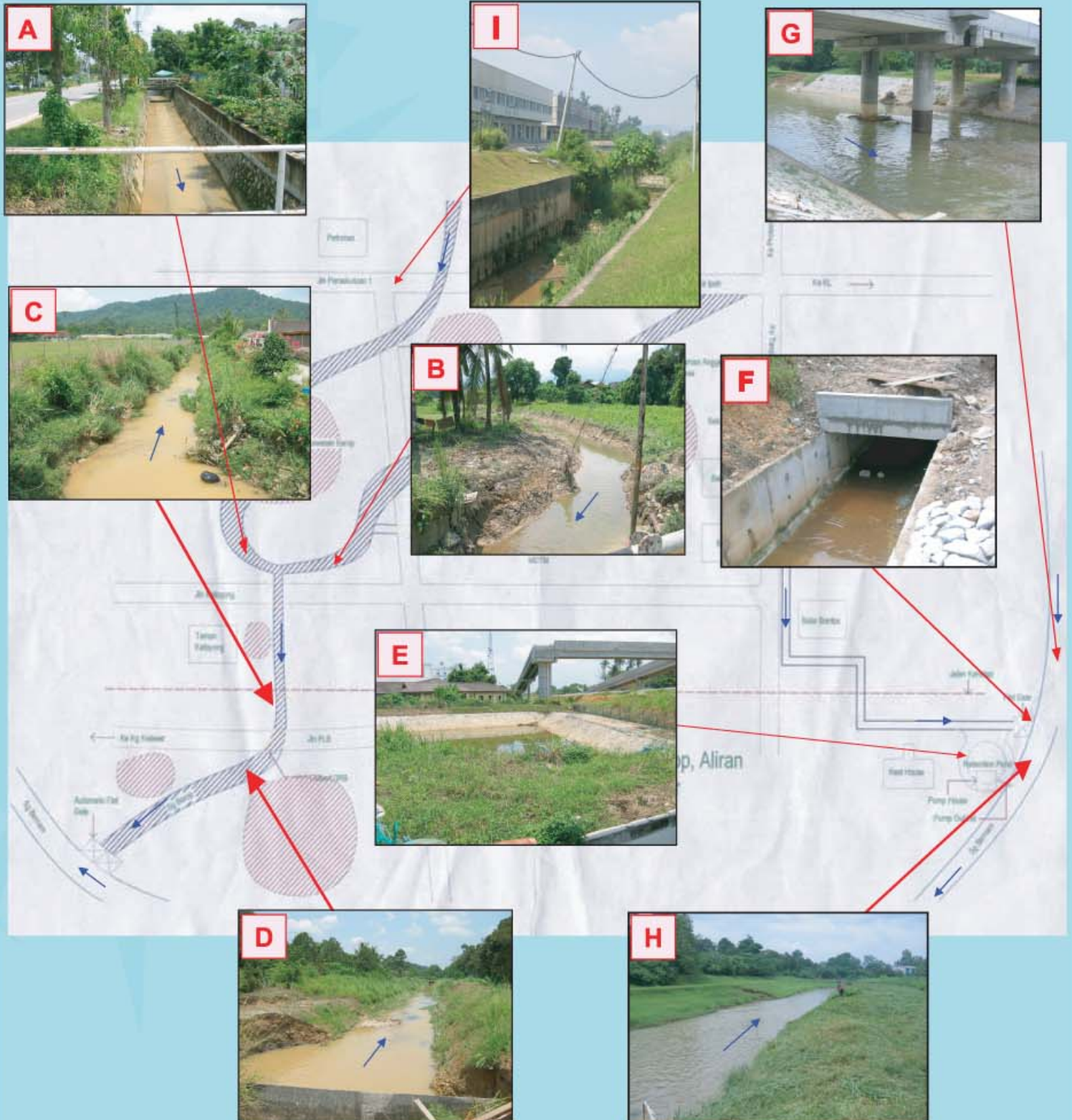
Bed Load Sampling @ Ladang Victoria New Bridge



Project Title : DRAINAGE MASTER PLAN STUDY FOR TANJUNG MALIM, PERAK DARUL RIDZUAN

Client : Tanjung Malim District Council (MDTM)

Period : 1st August 2006 - 31st October 2007



VISIT TO BIOECODS™



Recreational Pond



KUKTEM

Kolej Universiti Kejuruteraan & Teknologi Malaysia

40 students and staf members of KUKTEM visited the project on 25th March 2006. They were given on-site briefings on the components of BIOECODS. Further explanations on the project and other relevant SUDS projects were given by REDAC Director at the Seminar Room, Administration Building



Engineered Waterway



Swale



VISIT TO BIOECODS™



BIOECODS Presentation by REDAC Director



VISIT TO BIOECODS™

KUiTTHO

(Kolej Universiti Teknologi Tun Hussein Onn)

30 staff of Civil Engineering and Environment Faculty has visited BIOECODS project on 13th June 2006.

Tour of the project site and briefing were conducted.



VISIT TO BIOECODS™



Engineered Waterway



Wet Pond



Recreational Pond



Recreational Pond



Rivers' 07 ANNOUNCEMENT

2nd International Conference on Managing
Rivers in the 21st Century:

“Solutions Towards Sustainable River Basins”

6th – 8th June 2007

Crowne Plaza Hotel, Kuching, Sarawak, Malaysia

Organised By:



BACKGROUND

Rivers'04 was organized by River Engineering and Urban Drainage Research Centre (REDAC), Universiti Sains Malaysia (USM) as the first conference in the series of triennial International Conference on Managing Rivers in the 21st Century. The purpose of it was to provide a major forum to researchers and engineers from national and international levels to present and exchange their views on the latest research issues and application methods to solve existing problems related to rivers in Malaysia and worldwide. Among major issues raised by paper presenters from various countries during the conference were the advancement of integrated river basin management via smart-partnerships among government, industry, NGOs and the public, the need for water quality assessments in urban areas, and the promotion of applying sustainable urban drainage systems. Sediment transport, river bank stabilization, and flood warning system were other topics well presented in the conference.

Rivers'07 will further highlight issues dealing with managing rivers such as flood management, water scarcity, water pollution, catchment management, and river conservation. The emphasis will be on sustainable management of rivers to preserve the natural environment of existing rivers in recognition of the future developments within the river basins.

CONFERENCE OBJECTIVES AND TOPICS

The national organizing committee is greatly honoured to invite all interested local and foreign researchers, engineers, policy and decision makers, administrators, educators, NGOs and the concerned public to present and exchange their knowledge views and experience on the latest problems and solution related to river basin sustainability in Malaysia and worldwide. The accepted paper presentation will be organized under the following topics:

1. Integrated River Basin Management
2. Watershed Land use Planning and Management
3. Flood forecasting and Flood Risk Management / Mitigation
4. Floodplain, river and estuarine rehabilitation
5. Sustainable Drainage System
6. Streams heritage restoration and conservation
7. Water quality treatment
8. Inland water transport
9. Soil Erosion and Sedimentation
10. Legislative and Policy



For more information:

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