

# Urban Stormwater Management Manual *for* Malaysia

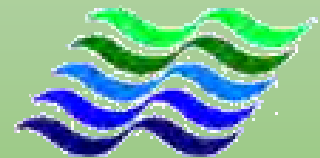
(Manual Saliran Mesra Alam)



By :

Ir. AZMI BIN AMAT

Stormwater Management Division  
Drainage and Irrigation Department of Malaysia



# OUTLINE

1

**Introduction**

2

**ISSUES**

3

**PAST DRAINAGE PRACTICE**

4

**WHY WE NEEDS STORMWATER MANAGEMENT**

5

**URBAN STORMWATER MANAGEMENT MANUAL**

5

**CONCLUSION**

# INTRODUCTION

# INTRODUCTION

- ❑ Malaysian economy has gone through rapid structural change since 1957.
- ❑ Urban growth is dynamic in accordance with the rapid economic growth and industrialization.
- ❑ This will **change the hydrologic cycle** and influence on the runoff pattern.
- ❑ In 1971, Malaysia suffered serious damage over the whole country due to the flood.
- ❑ Government gave the Department of Irrigation and drainage (DID) the task of planning Implementation of Urban Drainage work as part of overall flood mitigation programs.

# ISSUES - FLOOD

## Flood

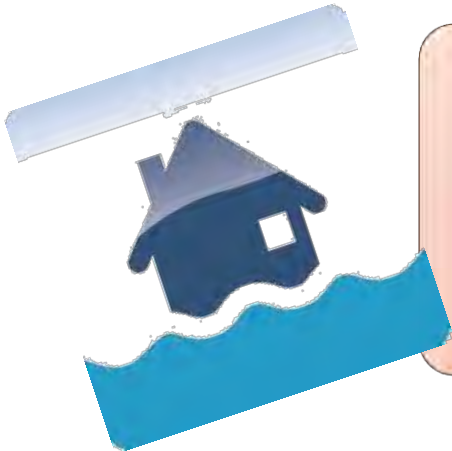
- Major problem in Malaysia

## Landuse For Urbanization

- Forest to agriculture
- Agriculture to urban areas

## Increase Flood prone areas

- 29,800 sq.km  
(about the size of Selangor + Perak)



# TYPES OF FLOOD



## Major Flooding

the main river overtop and cause widespread flooding of long duration



## Flash Flood

a short duration flood that is very localized

- Flood condition varies from state to state.
- Flood level varies from 0.2m up to 5m(extreme cases).
- Size of flood <100 ha. to a few thousand ha.



# FLASH FLOOD DEFINITION



- **Usually** occur in **urban** areas
- Caused by **short, intense, localized** thunderstorms that occurs **< 3 hours**

– Flood water **rise almost immediately** during the storm and water will **recede within 6 hours** after the rain



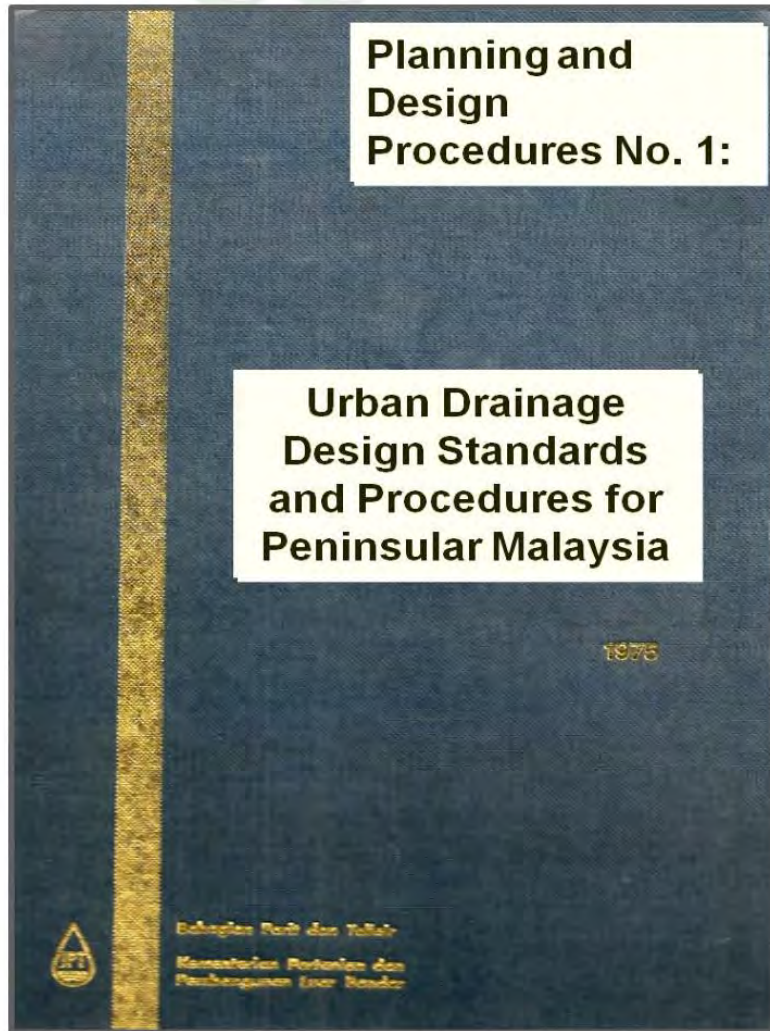
# CAUSES OF FLOODING

- **Short, intense localised thunderstorms**, the type of storm usually experienced in the evening
- **Rapid and Uncontrolled Development** in catchment areas resulting in Heavy Siltation
- **Obstructions in River Flow** System that Reduce in River Flow Capacity
- **Limited available space** for River Improvement works to handle the ever increasing flood flow due to escalating urbanisation process
- **Insufficient internal drainage systems** within the town area → undercapacity



# PAST DRAINAGE PRACTICE

# PAST DRAINAGE PRACTICE



# 1975

Conveyance  
oriented

- Rapid disposal
- Localised in nature
- Single function (quantity control)
- Hard engineering

# CONVEYANCE ORIENTED – HARD STRUCTURE





# CONVEYANCE ORIENTED – WIDENING RIVER



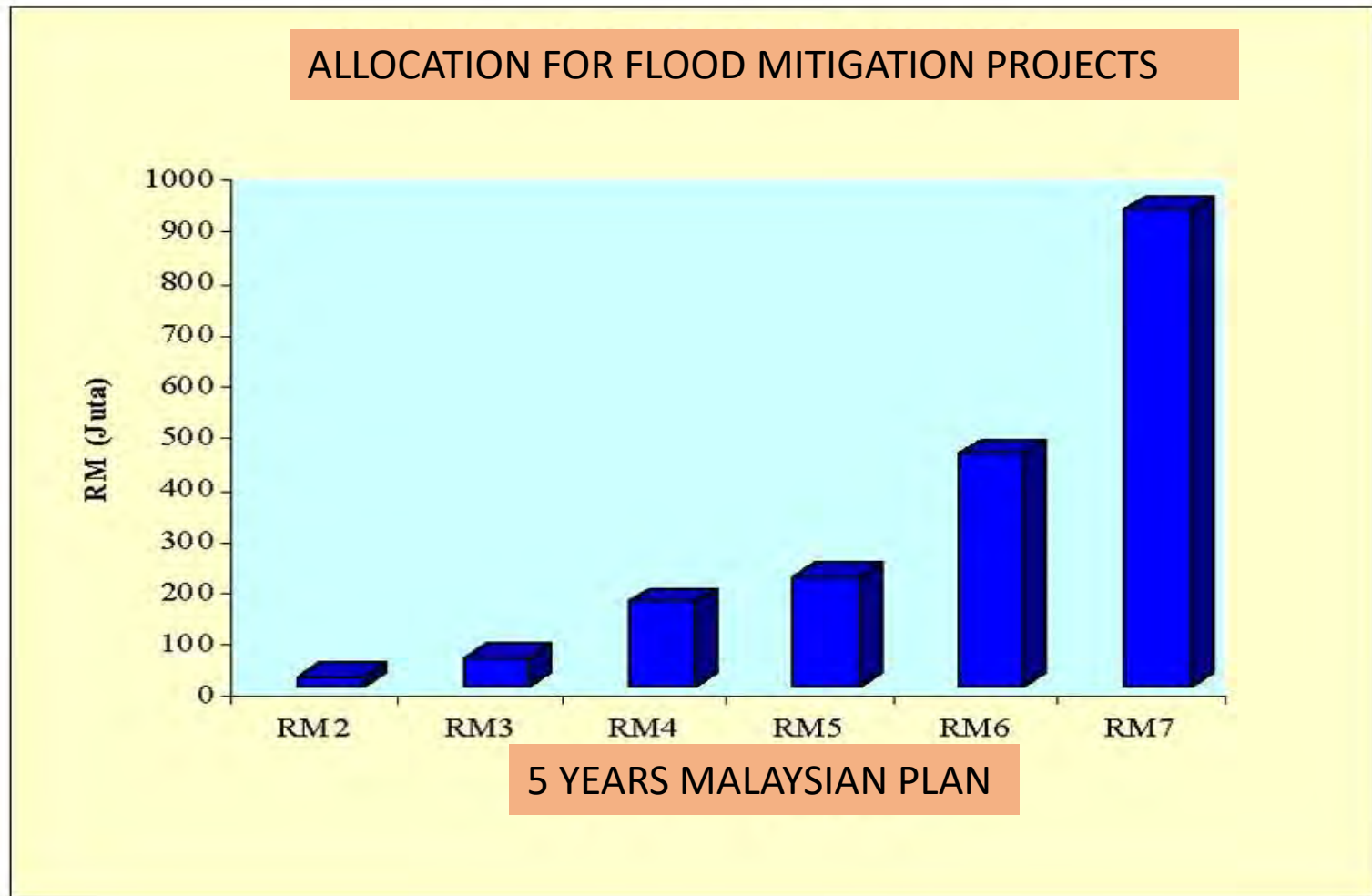
**Widening of The River Channel**

## CONVEYANCE ORIENTED – LAND PROBLEM



**Widening and deepening at the town city center is not applicable due to land accusation too high.**

# CONVEYANCE ORIENTED – HIGH COST



Allocation for Flood Mitigation Programmed

# WHY WE NEEDS STORMWATER MANAGEMENT





# WHY WE NEEDS STORMWATER MANAGEMENT

- a) **Urbanisation** – Land use Change
- b) **Flash Flood locations** the whole nations Increasing
- c) **Government allocation** to mitigate flood increase
- d) **Water Pollution**
- e) **Water Scarcity**



# URBANIZATION – LANDUSE CHANGE

JALAN BUKIT BINTANG - 1950



Jalan Bukit Bintang, 1950



Ampang Park, 1970



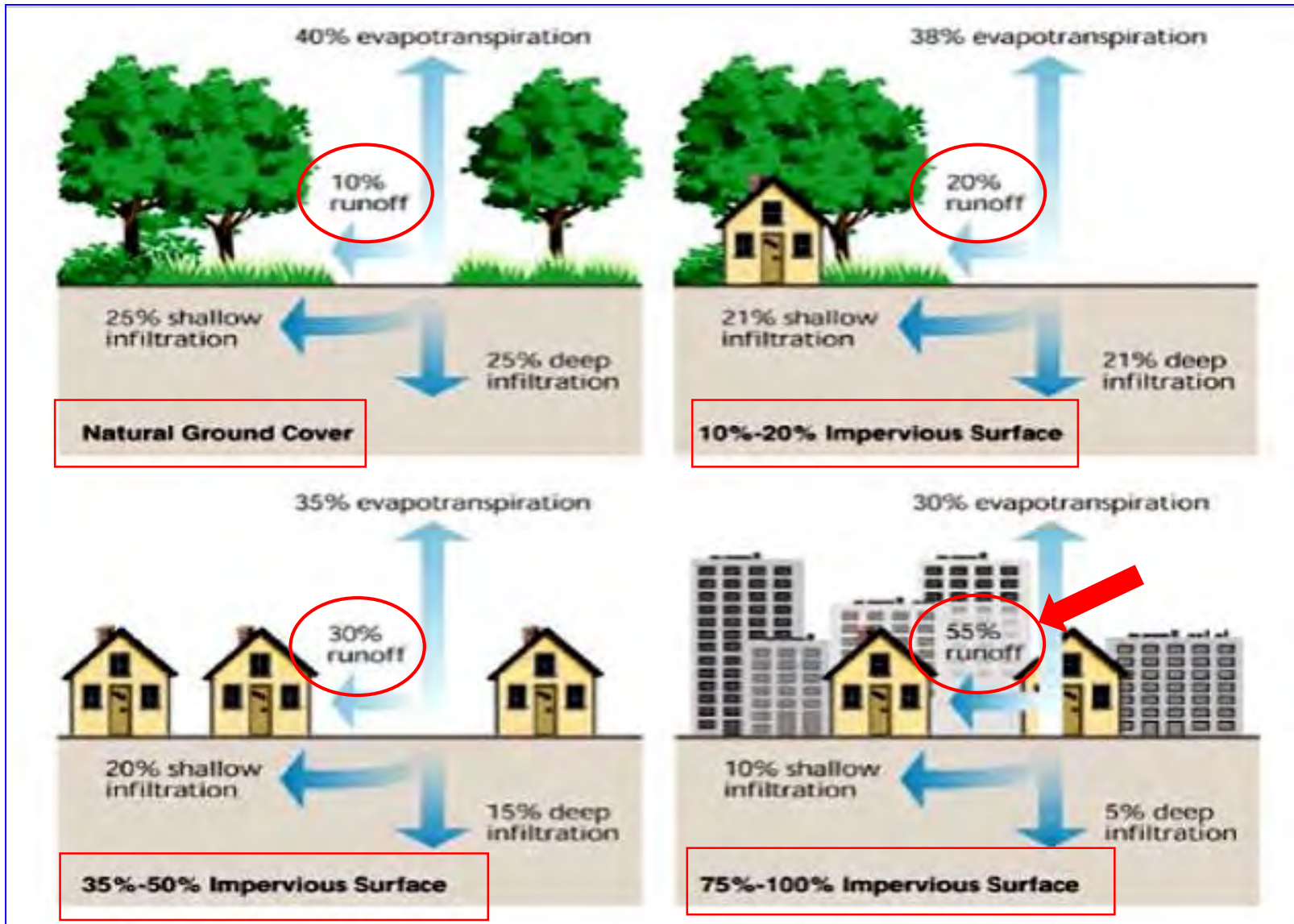
Jalan Bukit Bintang, 2017



Ampang Park, 2017



# CHANGES IN HYDROLOGY AND RUNOFF DUE TO DEVELOPMENT



# IMPACT OF UNCONTROLLED DEVELOPMENT



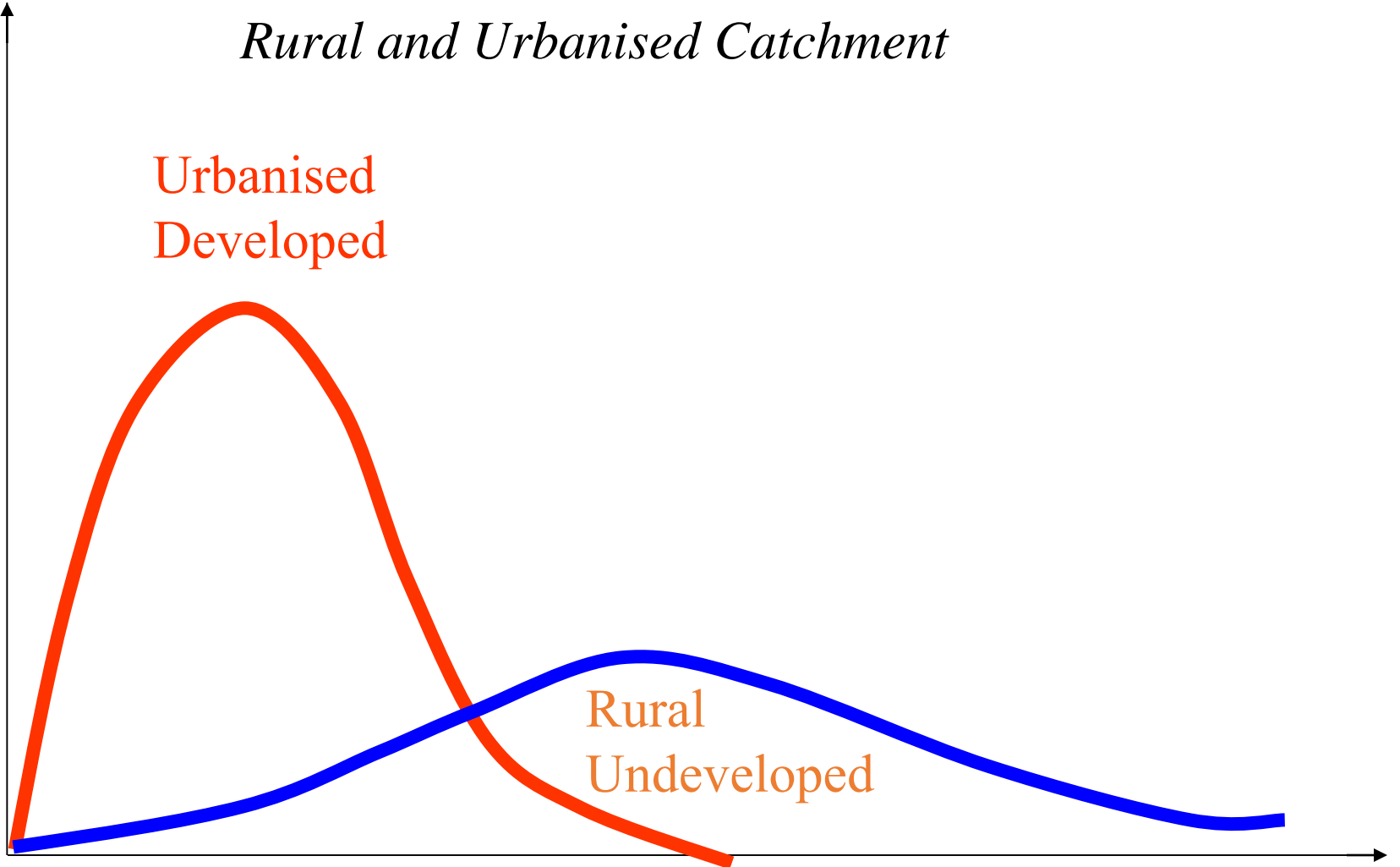
Flow

*Flow Characteristics  
Rural and Urbanised Catchment*

Urbanised  
Developed

Rural  
Undeveloped

Time



# URBAN STORMWATER MANAGEMENT MANUAL *for* MALAYSIA



# Urban Stormwater Design References for Malaysia :

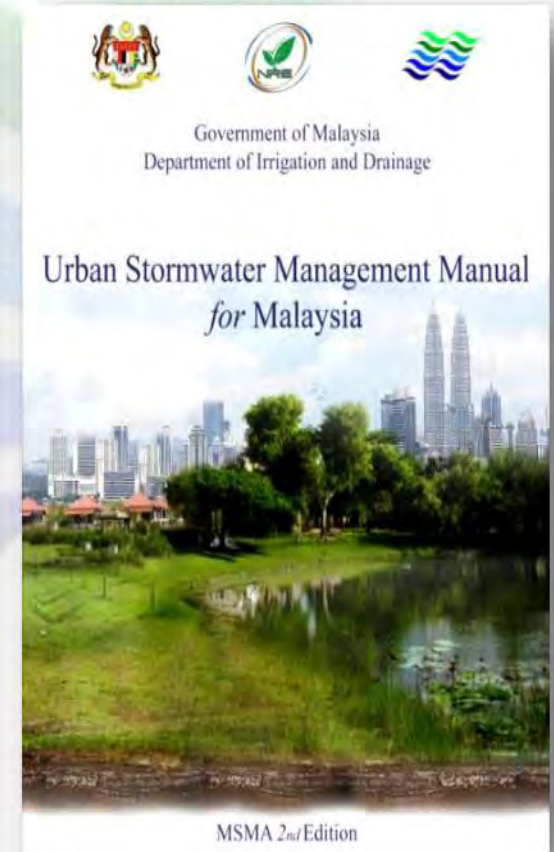
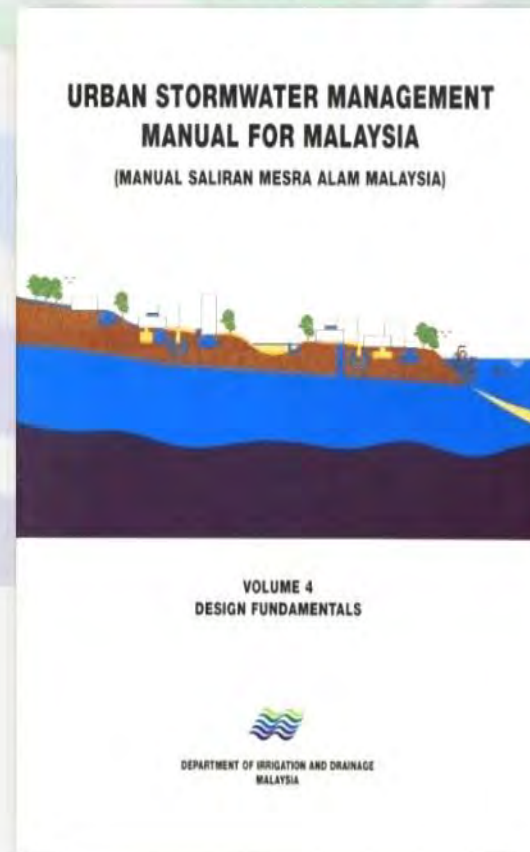
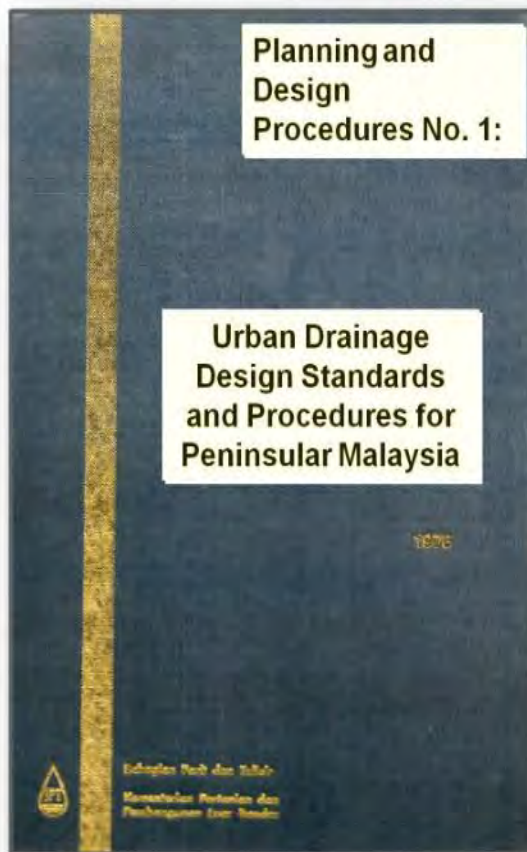
**1975**



**2000**



**2011**





25 years later ...

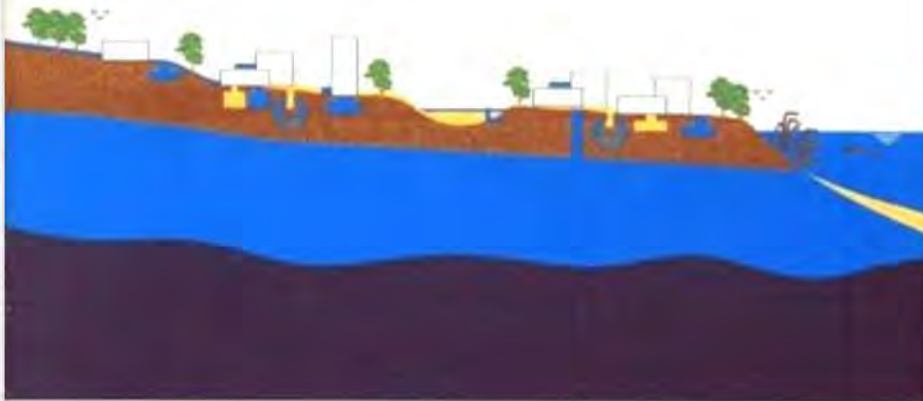
# 2000

Control at source

- **Flow control  
(water storage)**
- **Quality control**
- **Sediment control**

## URBAN STORMWATER MANAGEMENT MANUAL FOR MALAYSIA

(MANUAL SALIRAN MESRA ALAM MALAYSIA)



VOLUME 4  
DESIGN FUNDAMENTALS



DEPARTMENT OF IRRIGATION AND DRAINAGE  
MALAYSIA



Government of Malaysia  
Department of Irrigation and Drainage

## Urban Stormwater Management Manual *for Malaysia*



MSMA 2<sup>nd</sup> Edition

The following 11 years

# 2011

## MSMA 2<sup>nd</sup> Edition

- **Control at source**
- **Improvement in the aspect of WQ**
- **More practical**

Download URL : <http://water.gov.my>

## OBJECTIVE STORM WATER MANAGEMENT IN MALAYSIA

- *Ensure the safety of the public*
- *Control nuisance flooding and provide the safe passage of less frequent and larger flood events*
- *Stabilize the land form and control erosion*
- *Optimize the land available for urban development*
- *Minimize the environmental impact of urban runoff on water quality*
- *Enhance the Urban Landscape*

# MSMA COMPONENT



1 Quantity Control

2 Quality Control

3 Erosion and Sediment Control

4 Operation and Maintenance

5 Esthetical Value



# 3 PHASES



**Stormwater Quantity Control**

1

**Flash Flood**



**Erosion and Sediment Control**

2

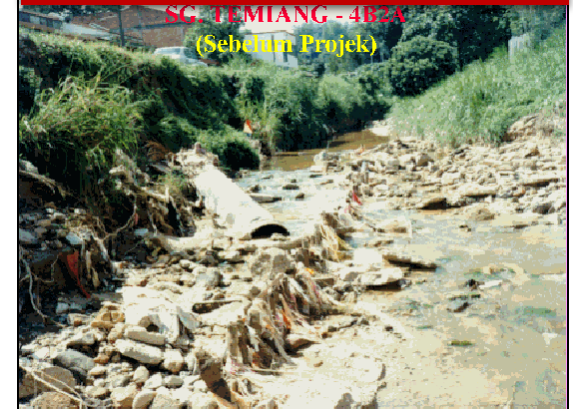
**Mud Flood**

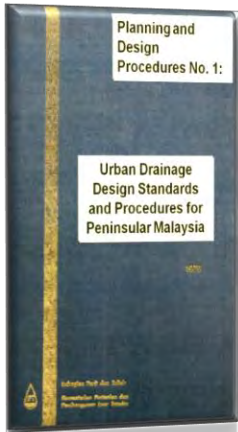


**Stormwater Quality Control**

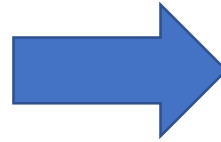
3

**Polluted Rivers**

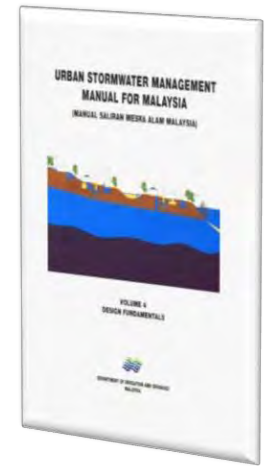




Conveyance  
Oriented



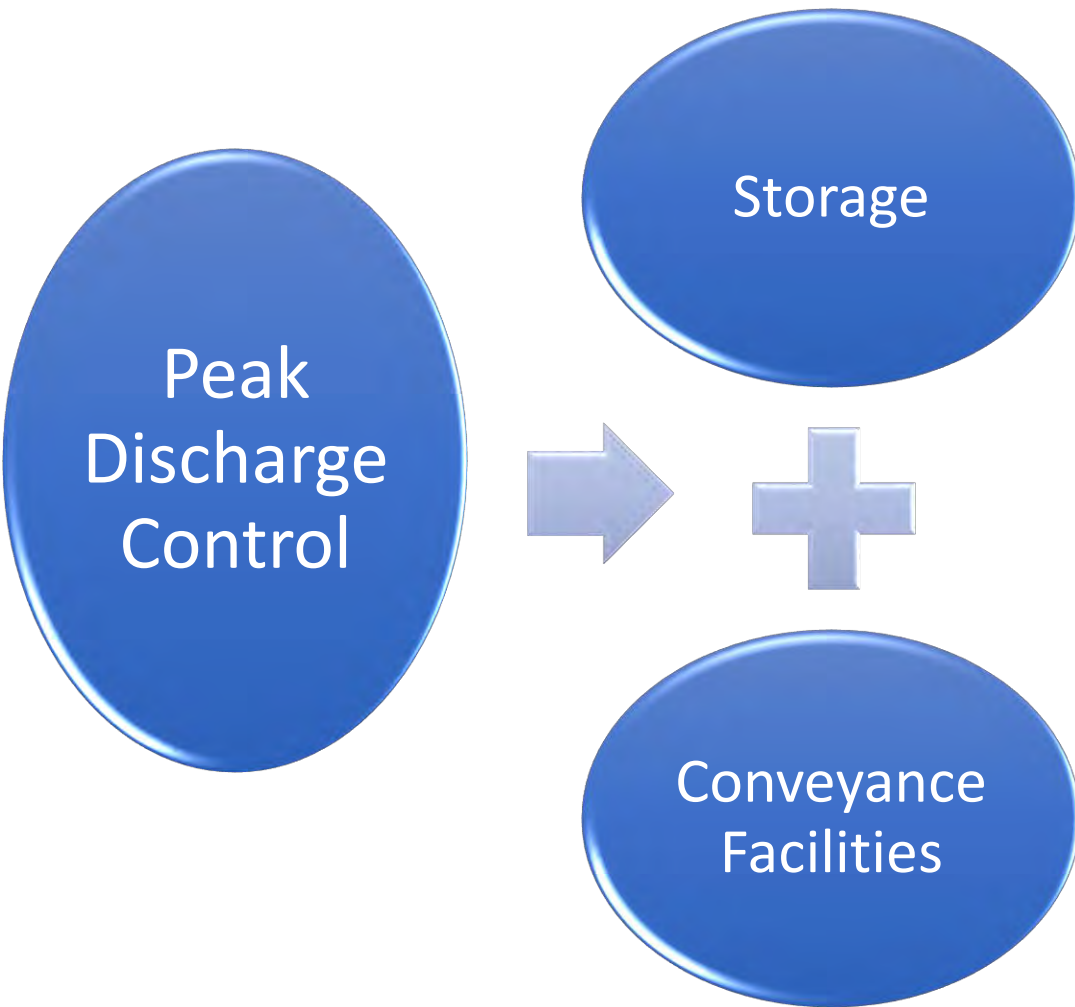
Storage  
Oriented



- conveyance systems must be sized for the total increase in flows resulting from urbanisation
- downstream conveyance systems often have insufficient capacity
- traditional hard lined open conveyance systems can be a hazard to the public during and after rain due to high flow velocities
- urban pollutants are transported to downstream areas

- In addition to the traditional conveyance-oriented approach, a potentially effective and preferable approach to stormwater management is the storage-oriented approach
- The principal elements and techniques used in a storage-oriented system are stormwater detention facilities and retention facilities.

# QUANTITY CONTROL – New Concepts

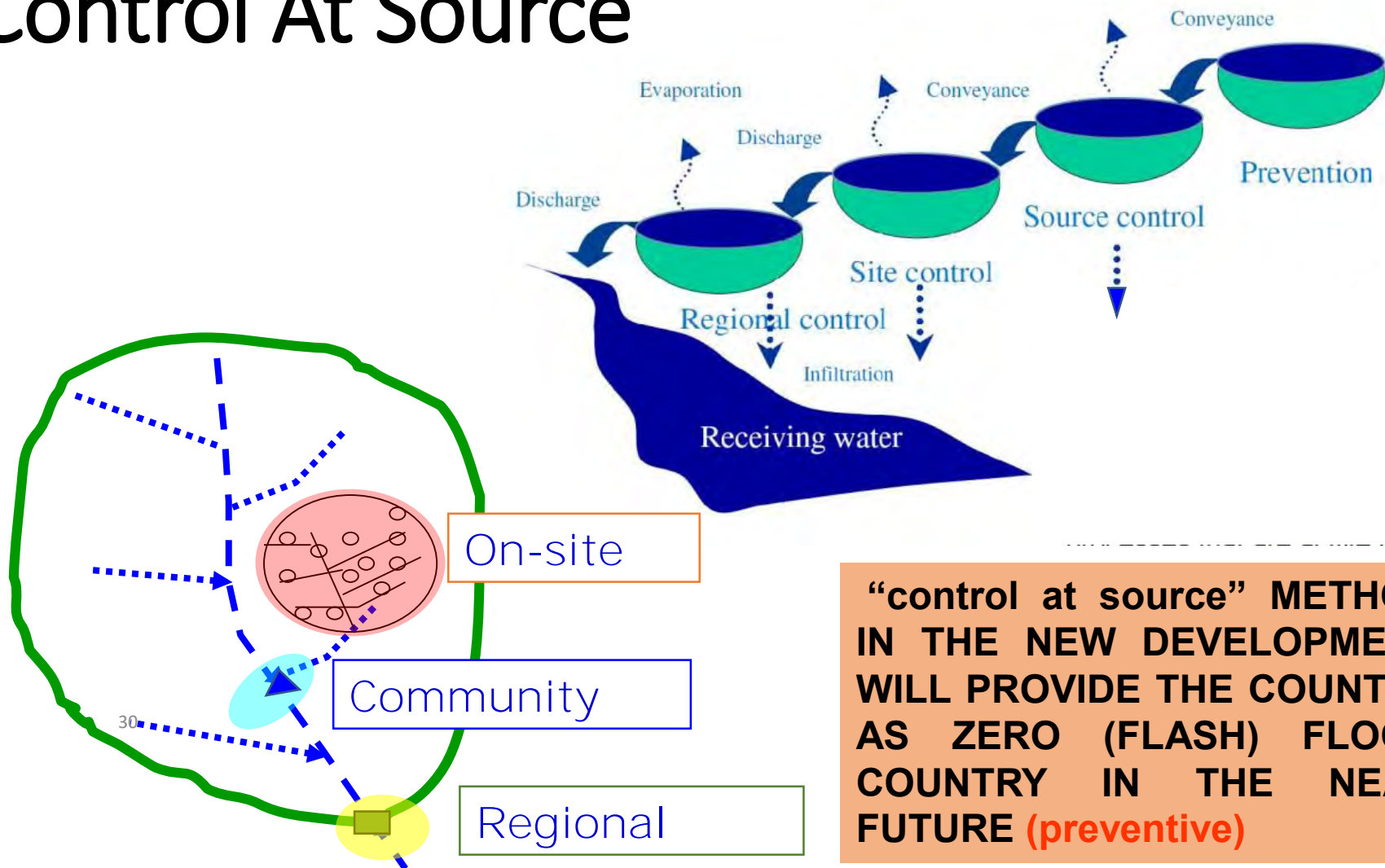


- Onsite Detention (OSD)
- Detention Pond
  - dry pond
  - Wet pond

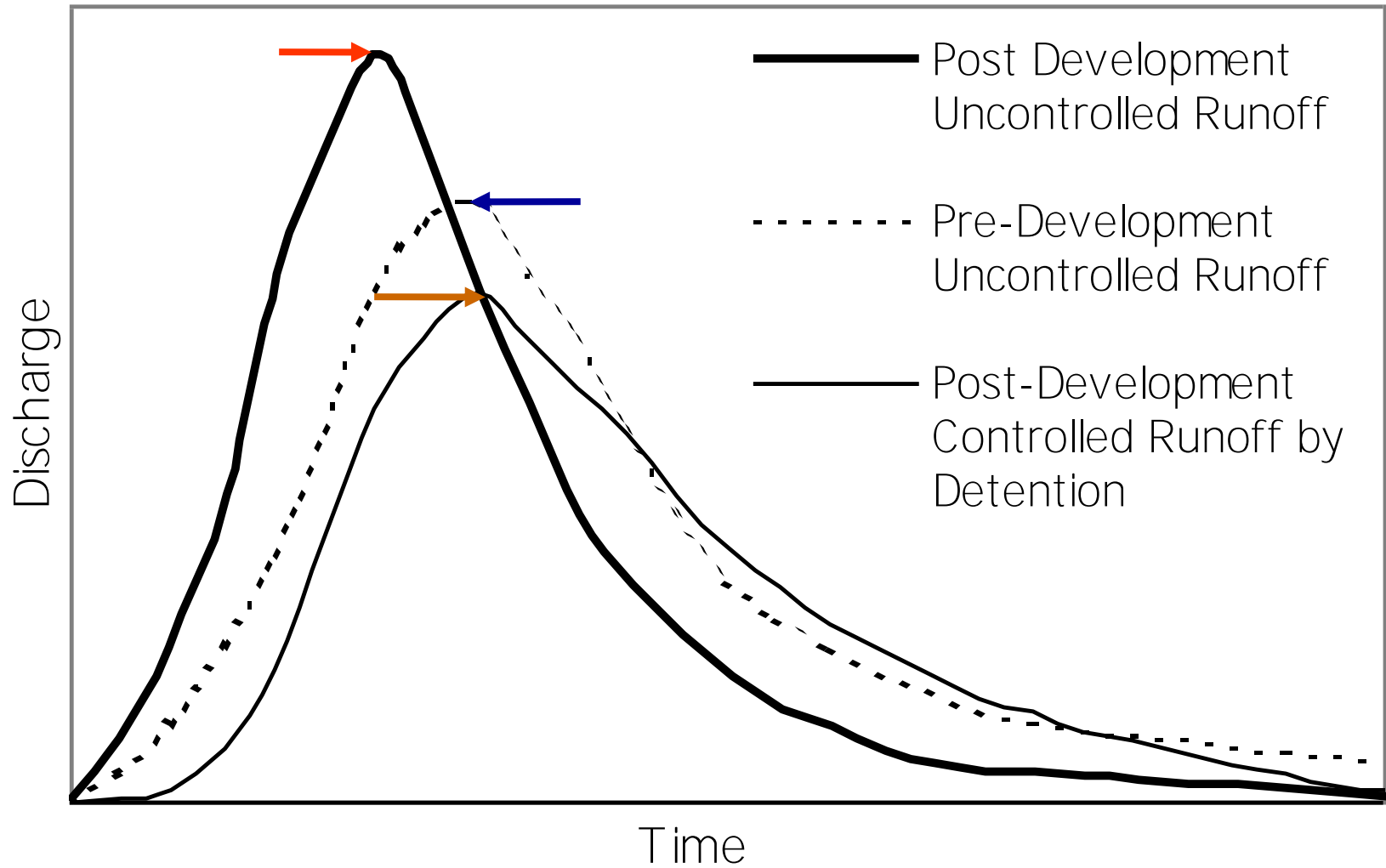
- Surface flow
- Property Drainage
- Pavement drainage
- Open Drain / Swale
- Pipe drain
- Engineered / Bio-engineered Waterways



# QUANTITY CONTROL – Control At Source



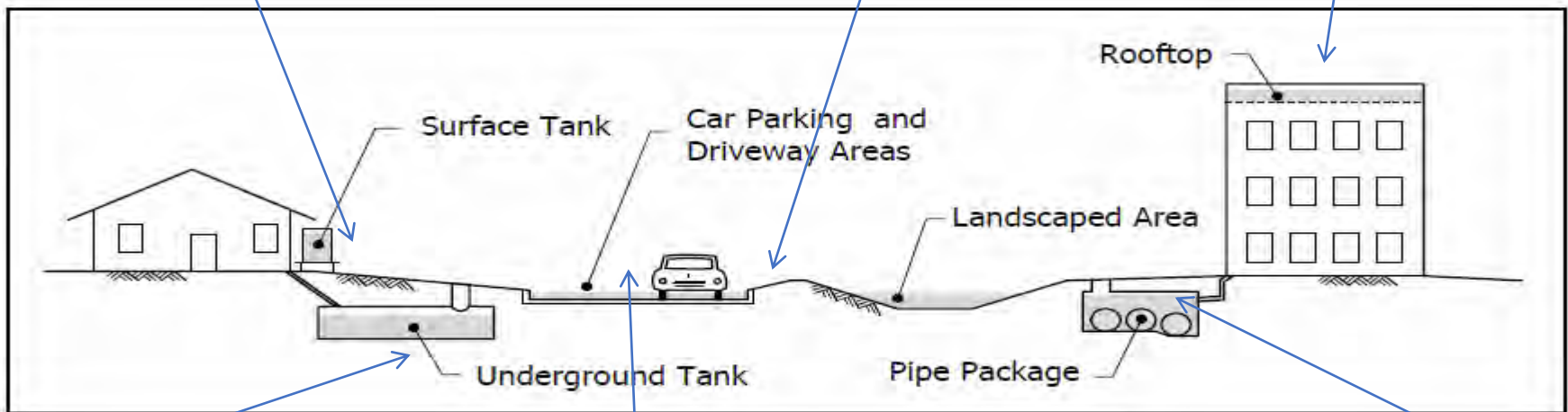
**“control at source” METHOD  
IN THE NEW DEVELOPMENT  
WILL PROVIDE THE COUNTRY  
AS ZERO (FLASH) FLOOD  
COUNTRY IN THE NEAR  
FUTURE (preventive)**



$$Q_{\text{post development}} \leq Q_{\text{pre-development}}$$

# Storage - OSD

*Apply for area < 5 ha*  
(individual OSD 0.1 ha)





# Storage - Pond

Recommended : Dry Pond 5-0 ha  
Recommended : Wet Pond > 10 ha



**Dry Pond**



**Detention Pond**





# Storage - Pond

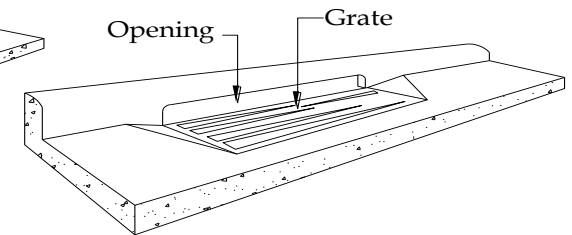
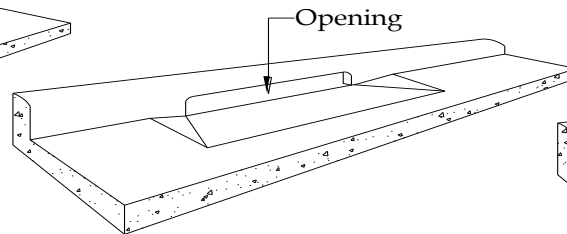
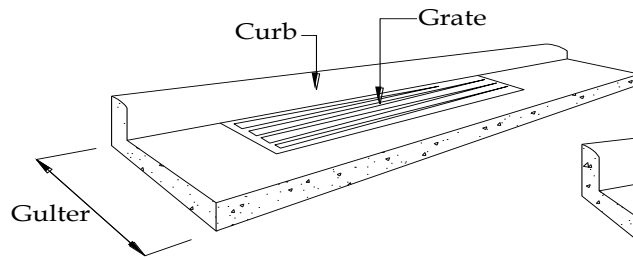




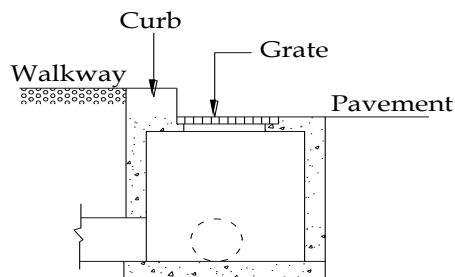
# Conveyance Facilities : Pavement Drainage



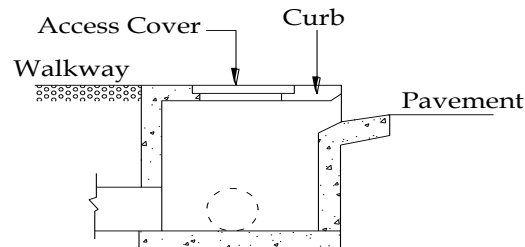
PERSPECTIVE



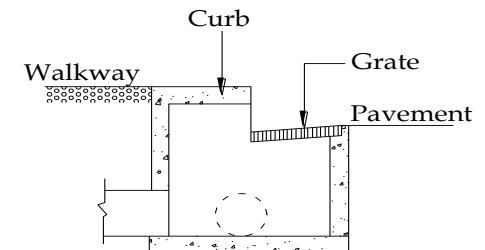
SECTION



a) Grate

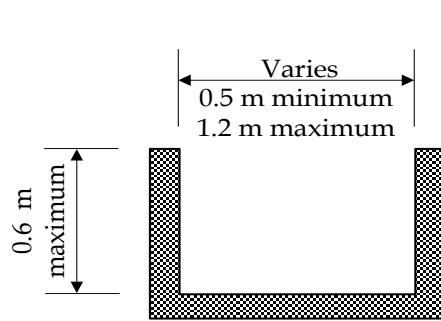


b) Curb Opening

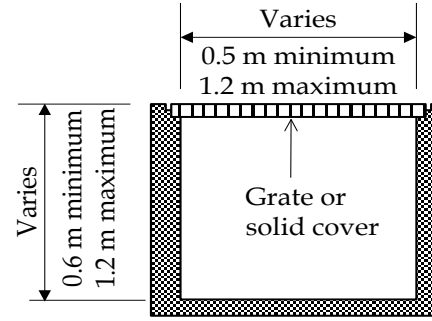


c) Combination

# Conveyance Facilities : Drains and Swales



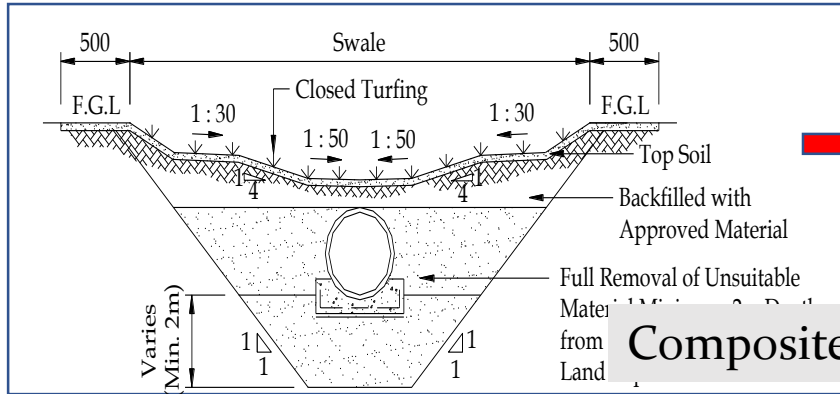
(a) Uncovered Open Drain



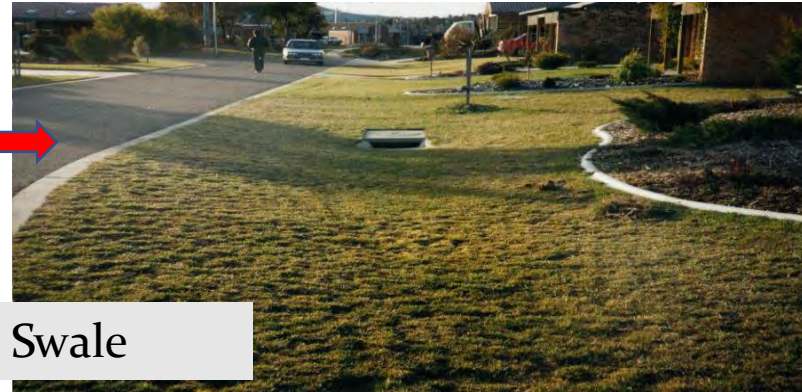
(b) Covered Open Drain

Lined Drains

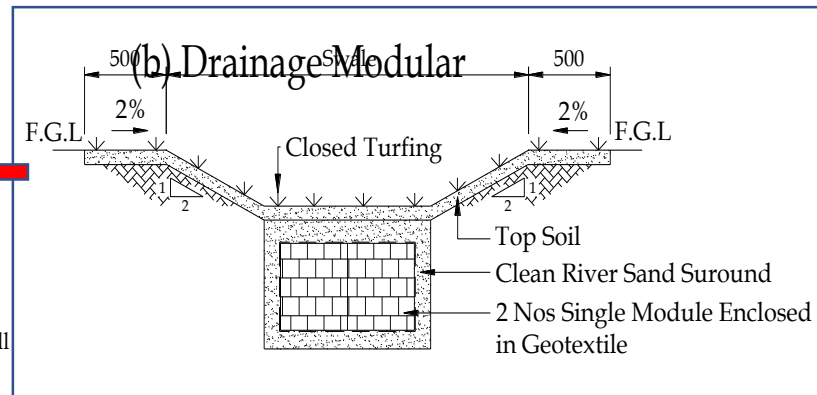
Remain



Composite Swale



(a) Underground Pipeline



(b) Drainage Modular



# Conveyance Facilities: Engineered Waterways





# Conveyance Facilities: Engineered Waterways

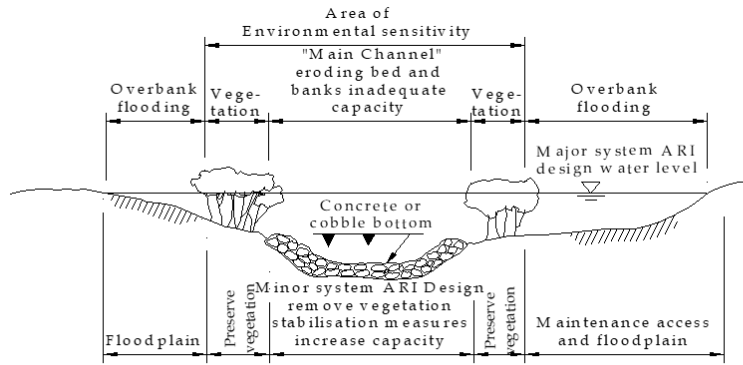


Engineered Channel

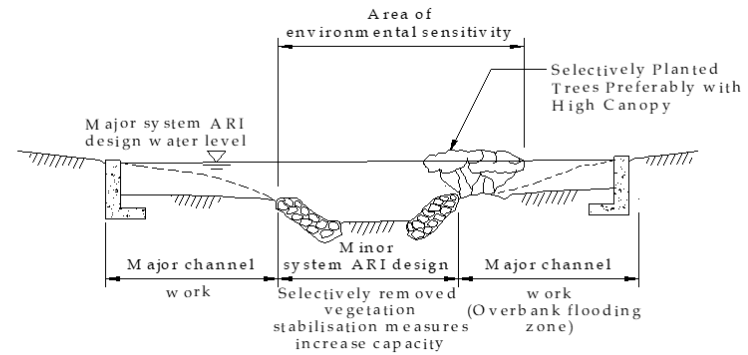


Grassed Channel

# Conveyance Facilities : Bioengineered Channel



(a) With Stabilisation Measures



(b) With Increased Capacity



TRM Technique



Gabion Mattress Reinforced Grass



Sand Filled Mattress Reinforced Grass





# BIOENGINEERED CHANNEL





# QUALITY CONTROL For Water Pollution

## Temporary BMPs

ESCP

Sediment Control

- Sediment Basin
- Sediment Trap

## Permanent BMPs

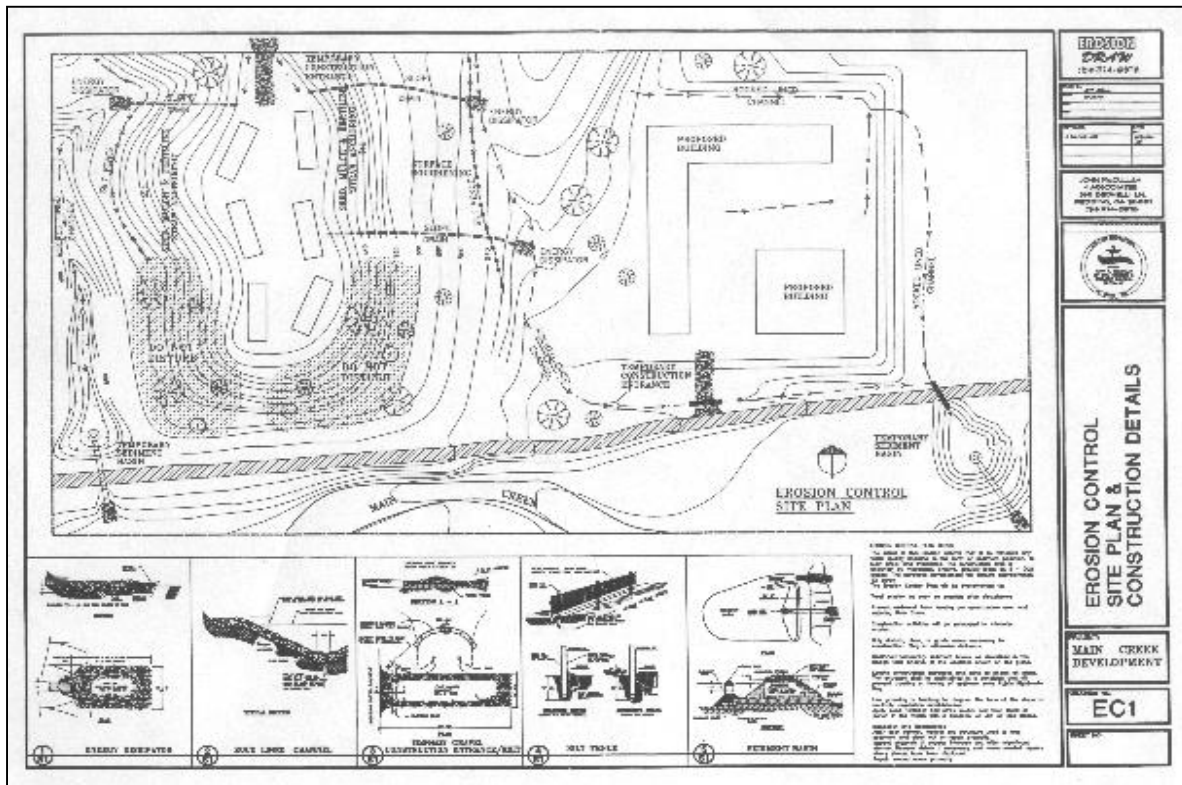
**Treatment Measures**

- Infiltration
- Bioretention System
- Swales
- GPT
- Water quality ponds/Wetlands

**Treatment Trains**

# What it is ESCP ?

An **ESCP** is a plan that details **temporary measures** that will be implemented during the construction phase



## Submission ESCP

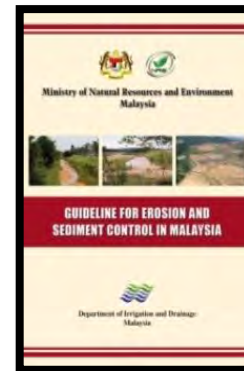
- The Erosion Sedimentation Control Plan (ESCP) shall be submitted for **project area more than 1 ha**.
- The plans must be prepared based on construction activities staging which covers land grading & earthworks (pre-bulk grading plan) and construction stage (post-bulk grading plan).
- For project area **less than 1 ha**, the developer shall submitted Best Management Practices Plan to control soil erosion and siltation onsite.
- The plan must prepared by PE and CPESC holder
- And the consultant responsible to make sure all the BMPs constructed and well maintained.



**Erosion and Sediment Control Principles**

# ESCP

- Temporary BMPs Facilities
- To minimize erosion and soil delivery away from construction site.
- No land clearing shall be allowed for the construction site before the installation of sediment control facilities onsite



**DID, 2010**  
**GUIDELINES FOR**  
**EROSION AND SEDIMENT**  
**CONTROL IN MALAYSIA**



# QUALITY CONTROL : Temporary BMPs

## Sediment Control



**Silt Fence**



**Silt Pond**



**Check Dam**

# QUALITY CONTROL : Permanent BMPs

## GROSS POLLUTANT TRAPS (GPT)

Type	Group	Description and Function	Catchment Area Range	Purpose-built or Proprietary
<b>GPT Type 1</b>	Floating Debris Traps (booms)	Litter capture on permanent waterbodies	> 200 ha	Proprietary and purpose built (on-line installation)
	Trash Racks & Litter Control Devices	Hard or soft litter capture devices on drains	2 – 400 ha	usually purpose built from modular components (on-line installation)
<b>GPT Type 2</b>	Sediment Basin and Trash Rack Traps (SBTR)	Sediment and litter capture for drains or pipes	5 – 2000 ha	Proprietary and purpose built (on-line or off-line installation)
<b>GPT Type 3</b>	Litter Control, Sediment Basin, Oil and Grease Trap	Litter, sediment and oil and grease, capture for drains or pipes	2 – 40 ha	Proprietary (on-line installation)

1



2



3





# QUALITY CONTROL : Permanent BMPs



Infiltration Trench



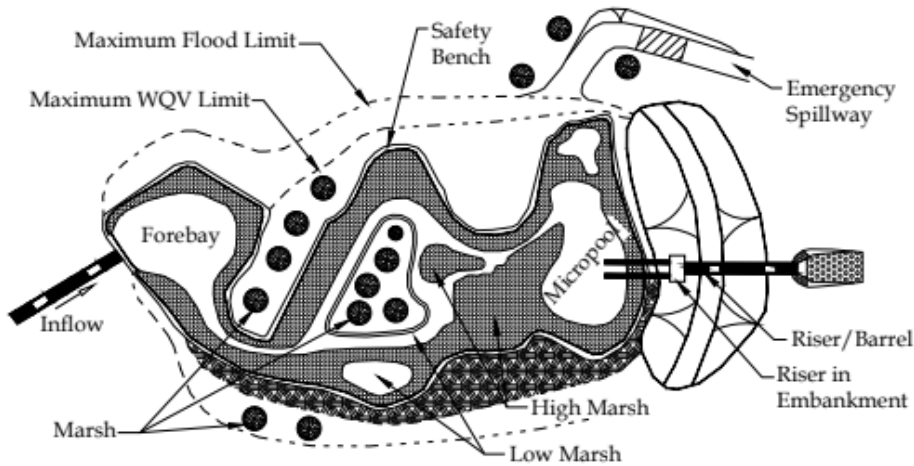
# QUALITY CONTROL : Permanent BMPs

**BIORENTATION**

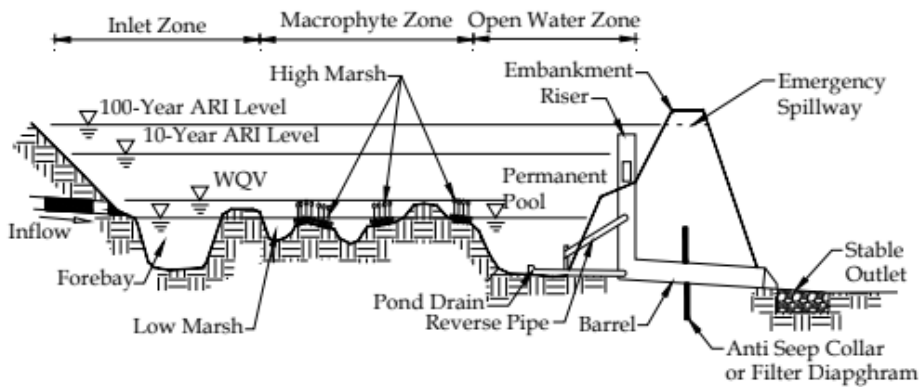
A photograph of a landscaped area. In the foreground, there is a green lawn. A brick path runs diagonally across the middle ground. To the right of the path, there is a row of large, green, leafy plants. In the background, there are modern buildings with large windows and several trees. The sky is blue with white clouds. On the right side, there is a small fenced-in area with white boxes, possibly a utility or maintenance area.



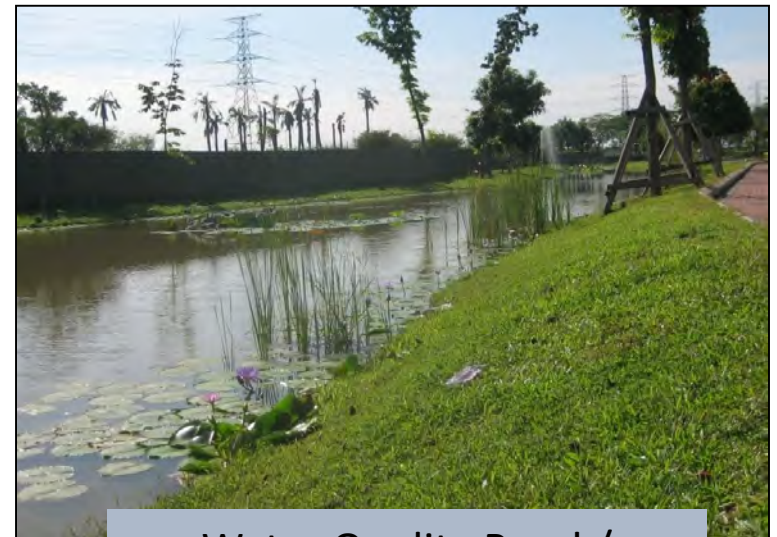
# Kawalan Kualiti: WATER QUALITY PONDS AND WETLANDS



(a) Plan



(b) Profile



Water Quality Pond /  
Constructed Wetlands



# ***CONSTRUCTED - WETLAND***







**Putrajaya  
Dam**





**The outflow of Putrajaya Lake into Sungai Langat**

# Conclusion

- **Stormwater Management Manual for Malaysia (MSMA) is a solution to flood, water resources and river pollution to Malaysia as a long term measure**
- **Reduced government expenditure on flood mitigation project**
- **As a basic of the development of “town in the garden concept” to become livable cities.**



# http://www.water.gov.my

The screenshot shows the homepage of the Malaysian Water Resources Management Authority (WRMA). The navigation bar includes links for Home, About Us, Our Services, Resource Centre, Media Centre, Information For, Contact Us, and Help. A search bar is located on the right. The main content area is divided into 'Core Business' and 'Services By Categories'. The 'Core Business' section lists Water Resources Management & Hydrology, Flood Management, Stormwater Management, River Management, and Coastal Management. The 'Services By Categories' section has tabs for Public, Business, DID's Sta, and Download. The 'Download' tab is circled in red, with a red arrow pointing to it from a box labeled 'Download'. Under the 'Download' tab, the 'Manual & Guidelines' section lists 'MSMA 1<sup>st</sup> Edition', 'MSMA 2<sup>nd</sup> Edition', and 'Guideline for Erosion and Sediment Control in Malaysia'. The 'MSMA 2<sup>nd</sup> Edition' link is circled in red, with a red arrow pointing to it from a box labeled 'MSMA 2<sup>nd</sup> Edition'. To the right, there is a login form with fields for Username and Password, and a 'Log in' button. Below the login form is a 'CALENDAR OF EVENT' for September 2012, showing dates from 1 to 30.



**THANKS YOU**  
*terima kasih*



# Rainwater detention & Vertical Green at Display Center

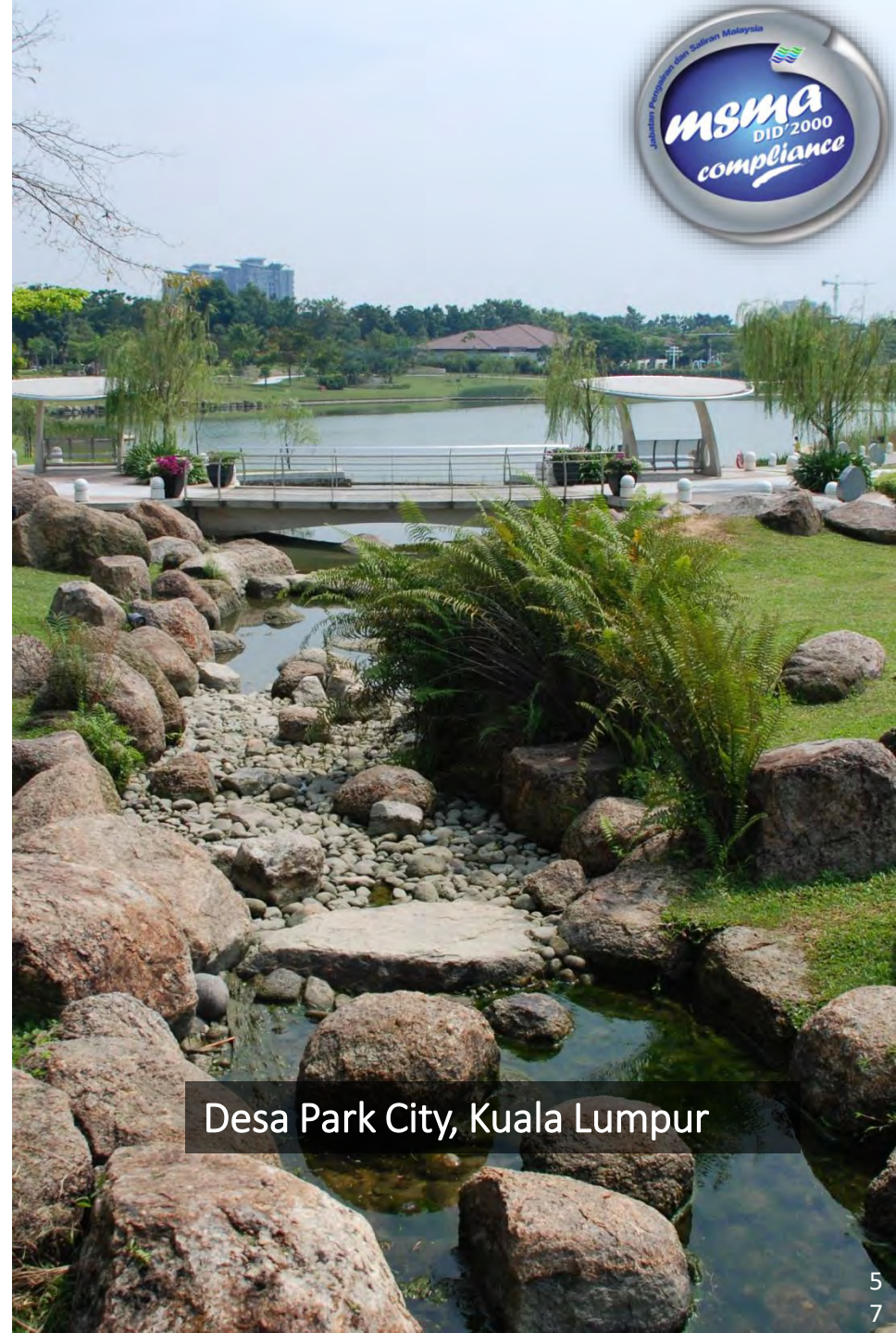
- SP Setia is one of the few developers conversant with Green Roof and Vertical Green Technology (Greenery on the walls of buildings).





# CONTOH PERLAKSANAAN MSMA

- Pond and infiltration Trench



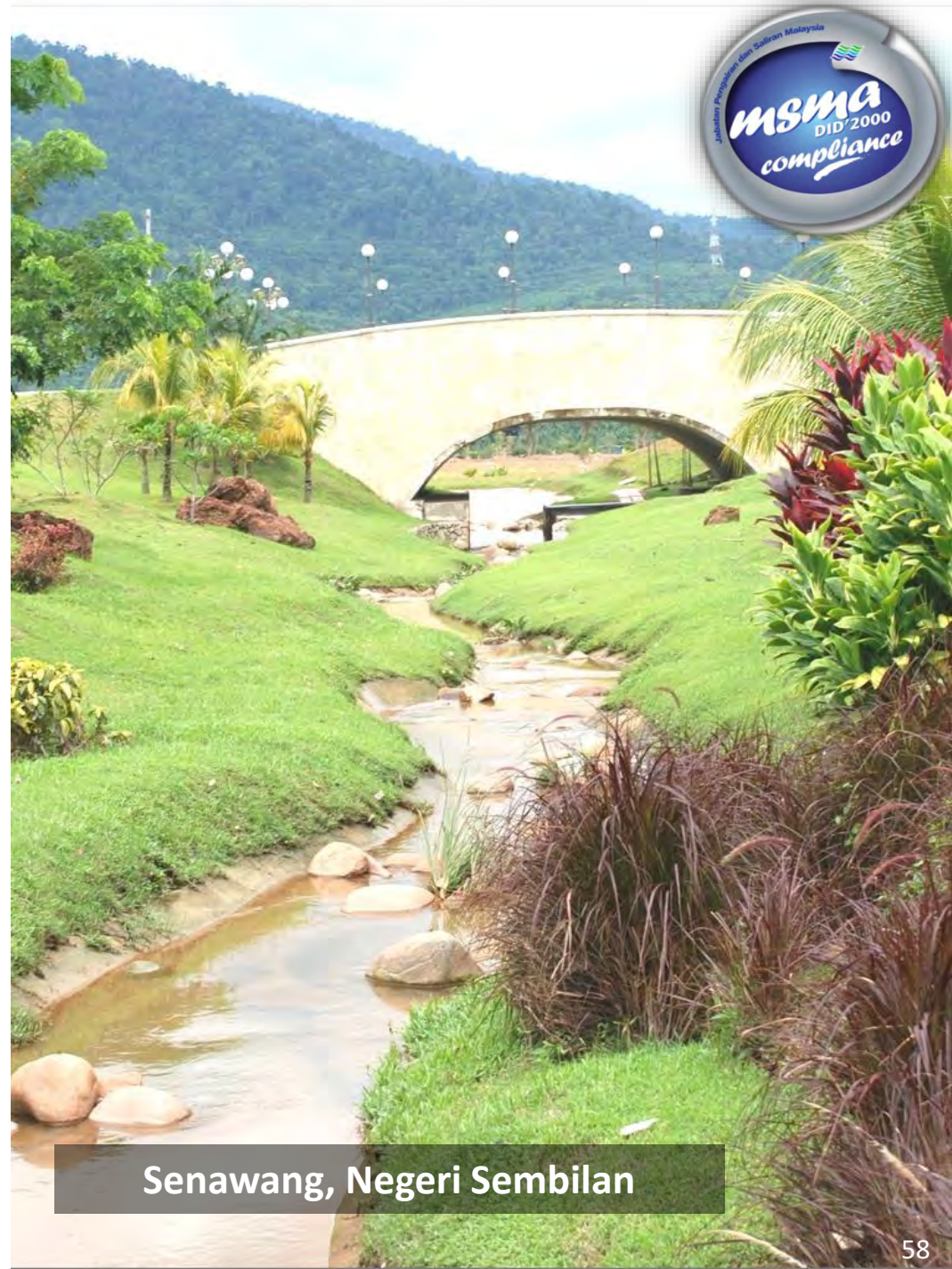
Desa Park City, Kuala Lumpur



# • CONTOH PERLAKSANAAN MSMA

- Structural Measure

## Engineered Waterway



Senawang, Negeri Sembilan



Kolam Metropolitan Kuala Lumpur

## CONTOH PERLAKSANAAN MSMA

### • Kolam Takungan

- Pemilihan kolam sebagai kawalan kuantiti dan pada masa yang sama boleh dijadikan alternatif kepada sumber air