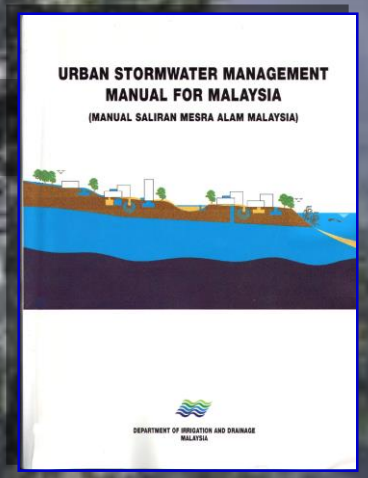
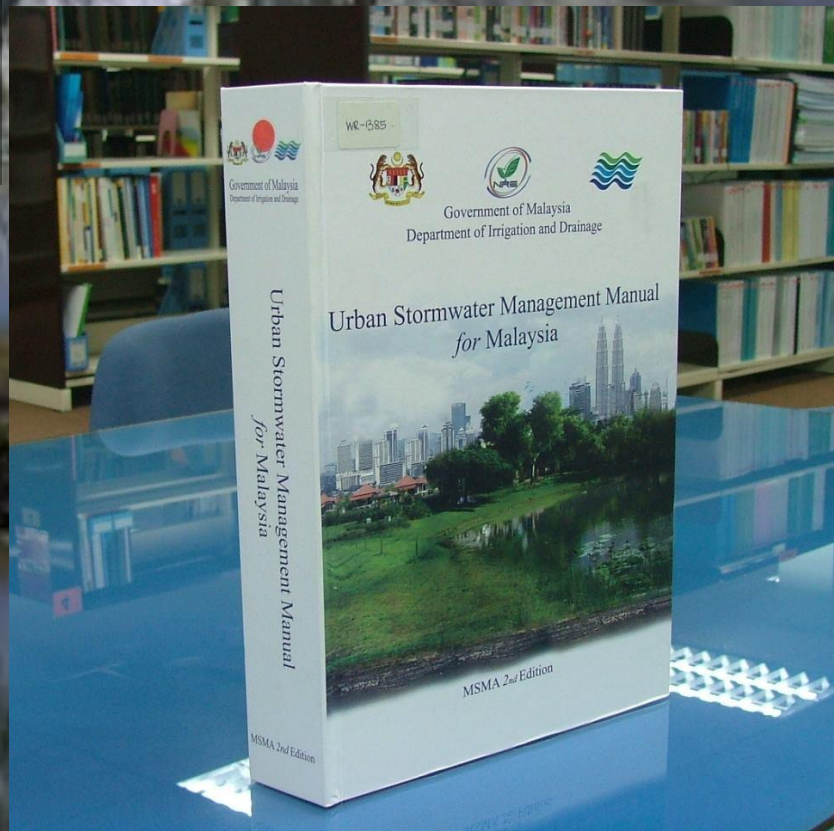
MSMA Water Quality Program

1. Stormwater Quantity Mgt
2. ESCP
3. Stormwater *Quality* Mgt





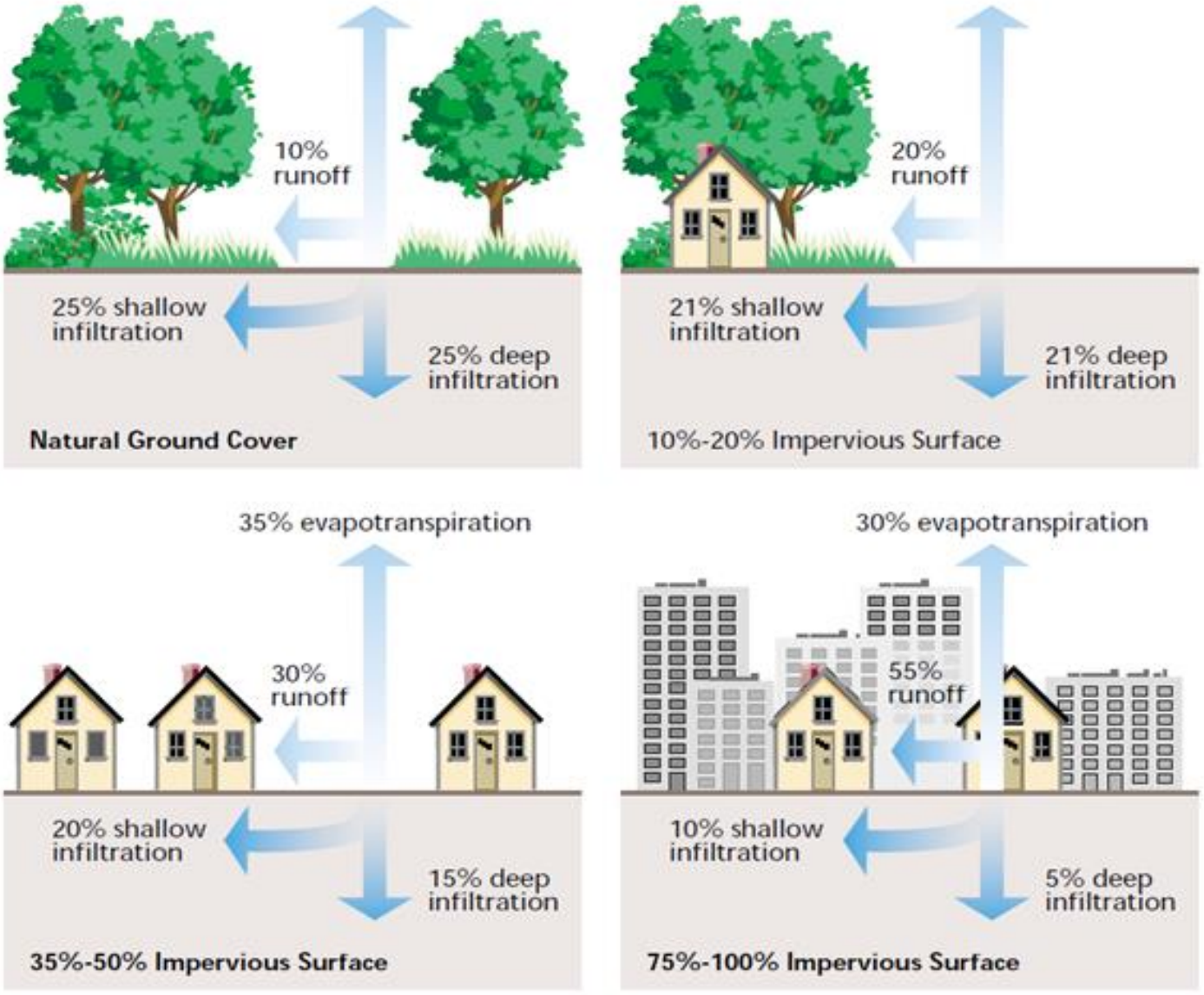
3 MAIN PARTS(PHASES) OF MSMA

Stormwater Quantity Control

Erosion and Sediment Control

Stormwater Quality Control

1. QUANTITY CONTROL



3. WATER QUALITY CONTROL

Table 1.4: Post-development Annual Pollutant Reduction Targets (Chap 1: Design Acceptance Criteria)

Pollutant	Reduction Targets (%)
Floatables/Litters	90
Total Suspended Solids (TSS)	80
Total Nitrogen (TN)	50
Total Phosphorus (TP)	50

New development: *percentage removal efficiency*
Redevelopment: *reduction in ave ann. pollutant load*

Table 1.4: Post-development Annual Pollutant Reduction Targets (Chap 1: Design Acceptance Criteria)

Parameter	Unit	Residential	Commercial	Industrial	Highway
TSS	mg/L	128.00	122.00	166.00	80.00
Turbidity	NTU	122.00	96.00	147.00	69.00
TDS	mg/L	131.00	43.00	37.00	38.00
pH	-	6.46	6.77	6.66	6.57
BOD	mg/L	17.9	22.90	19.30	14.90
COD	mg/L	97.00	134.00	140.00	81.00
AN	mg/L	0.73	0.85	1.00	0.44
TKN	mg/L	2.38	2.53	4.25	1.43
TN	mg/L	4.21	4.84	5.00	2.25
TP	mg/L	0.34	0.32	0.49	0.16
O&G	mg/L	2.00	4.00	NA	3.00
Zn	mg/L	0.19	0.34	0.43	0.21
Pb	µg/L	6.00	22.00	12.00	20.00
Cu	µg/L	28.00	37.00	42.00	28.00
Cr	µg/L	4.00	32.00	31.00	11.00
Ni	µg/L	10.00	17.00	30.00	15.00
Cd	µg/L	6.00	26.00	5.00	10.00

Source: DID studies in Malacca, Damansara, Penang and Kajang

The load estimated by EMC method is

$$L = R \cdot EMC \cdot A \cdot C_V / 100$$

where,

L = Annual pollutant load (kg/year);
R = Mean annual rainfall-MAR (mm/year);
EMC = Event mean concentration (mg/L);
A = Catchment area (ha); and
Cv = Area-weighted volumetric runoff coefficient for the whole catchment (Table 2.5).

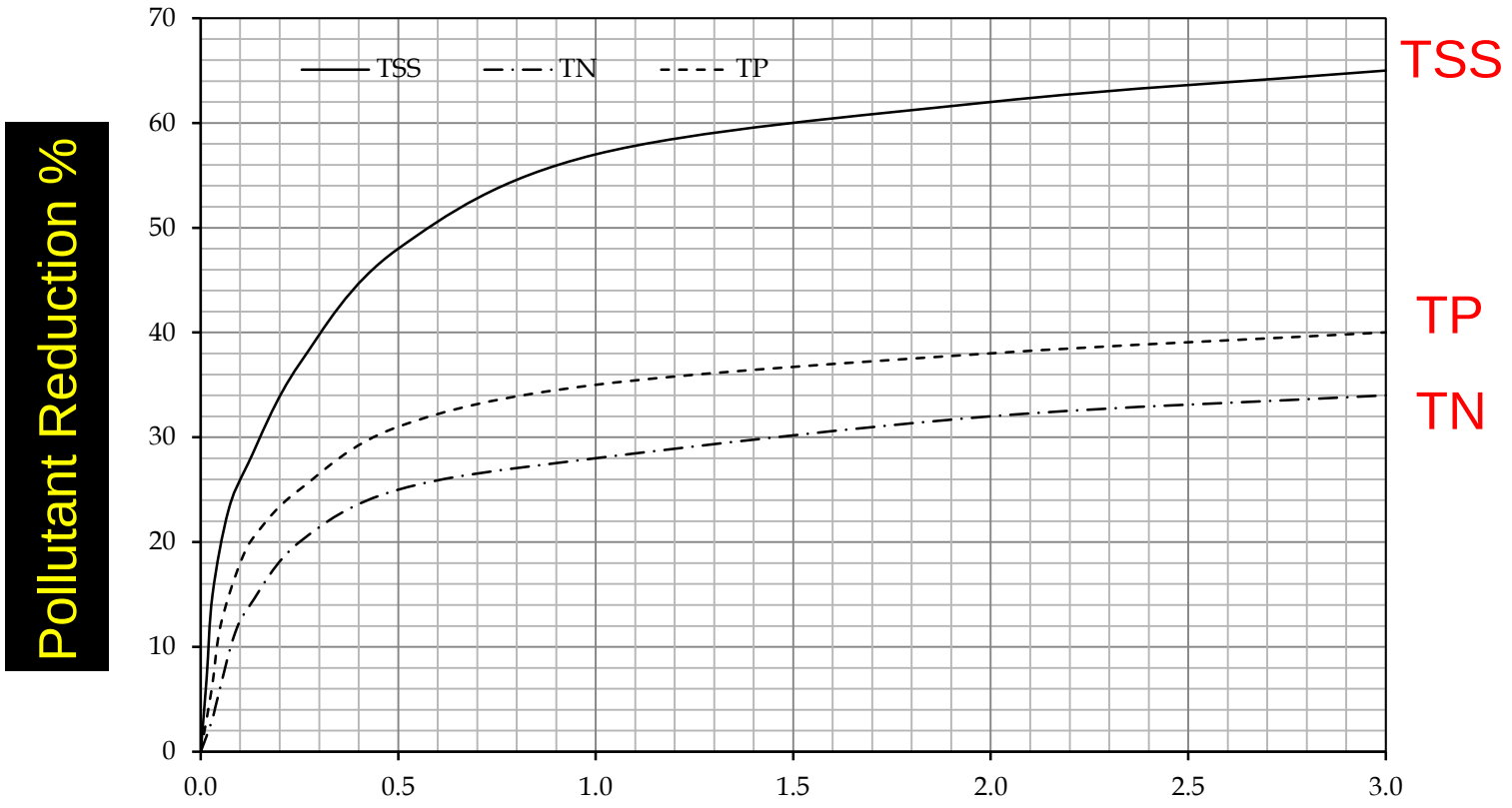
Table 2.5: Recommended Runoff Coefficients for Various Landuses

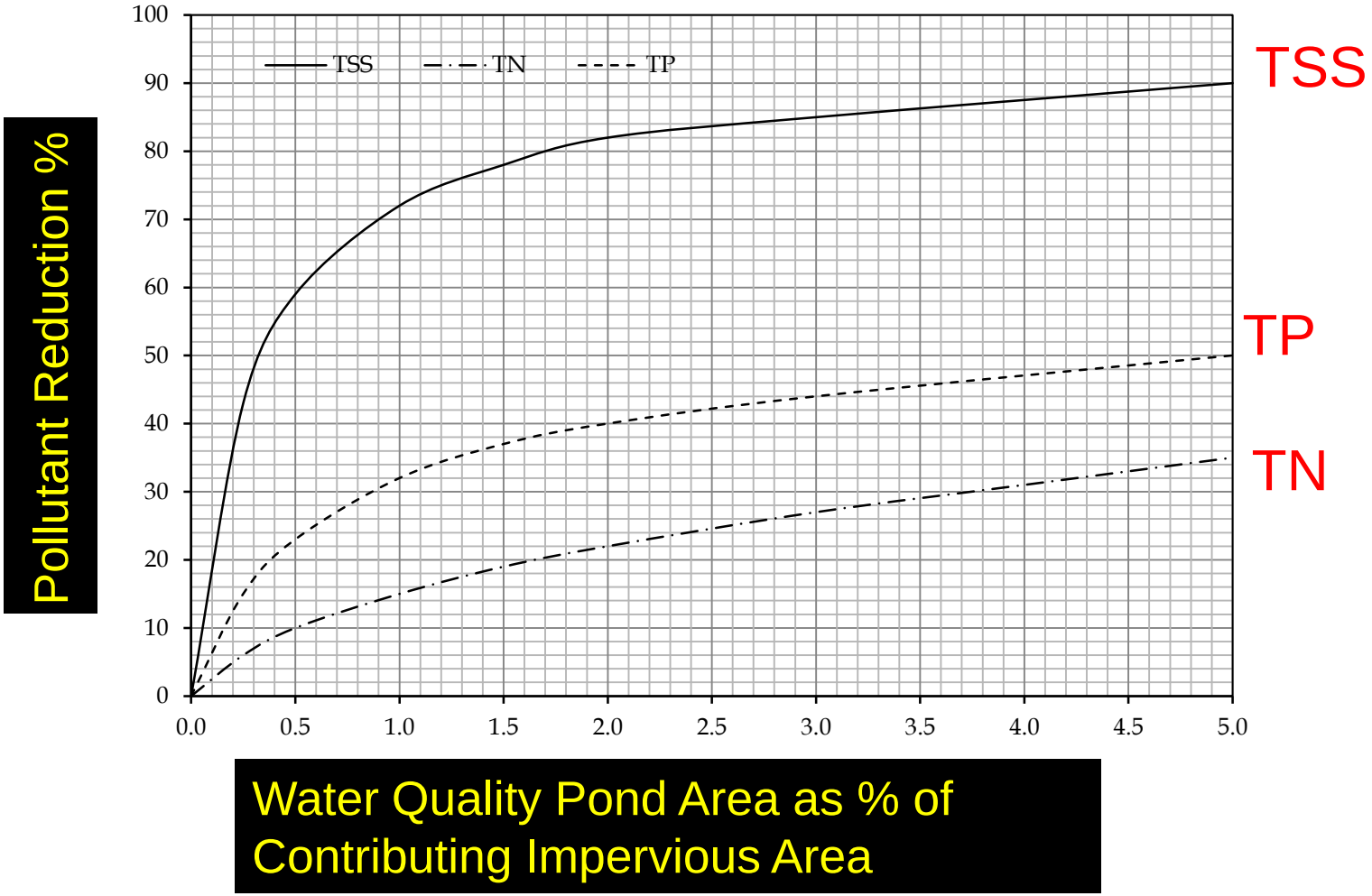
Chap 2: Quantity Design Criteria

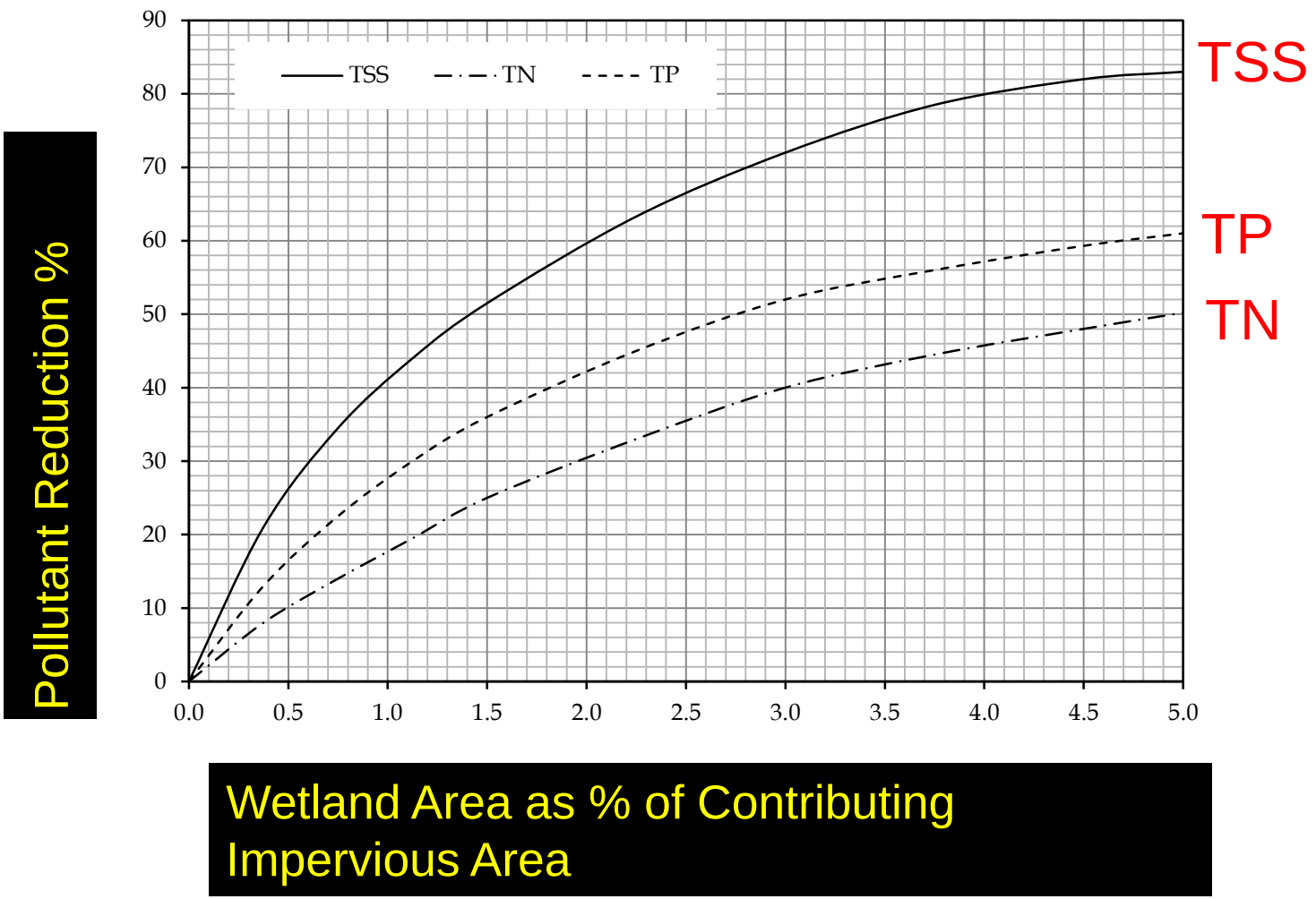
Landuse	Runoff Coefficient (C)	
	For Minor System (≤10 year ARI)	For Major System (> 10 year ARI)
Residential		
Bungalow	0.65	0.70
Semi-detached Bungalow	0.70	0.75
Link and Terrace House	0.80	0.90
Flat and Apartment	0.80	0.85
Condominium	0.75	0.80
Commercial and Business Centres	0.90	0.95
Industrial	0.90	0.95
Sport Fields, Park and Agriculture	0.30	0.40
Open Spaces		
Bare Soil (No Cover)	0.50	0.60
Grass Cover	0.40	0.50
Bush Cover	0.35	0.45
Forest Cover	0.30	0.40
Roads and Highways	0.95	0.95
Water Body (Pond)		
Detention Pond (with outlet)	0.95	0.95
Retention Pond (no outlet)	0.00	0.00

Note: The runoff coefficients in this table are given as a guide for designers. The near-field runoff coefficient for any single or mixed landuse should be determined based on the imperviousness of the area.

Figure 3.1: Pollutant Reduction Curves – (from Melbourne Water, 2005 and Darwin Harbour, 2009)




Pollutant Reduction %
TSS
TN
TP
100
90
80
70
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
TSS
TN
TP
TSS
TP
TN
Water Quality Pond Area as % of Contributing Impervious Area


Pollutant Reduction %
TSS
TN
TP
90
80
70
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
TSS
TN
TP
TSS
TP
TN
Wetland Area as % of Contributing Impervious Area

3 : Stormwater Quality Mgt

Put in GPTs for all main drain outlets

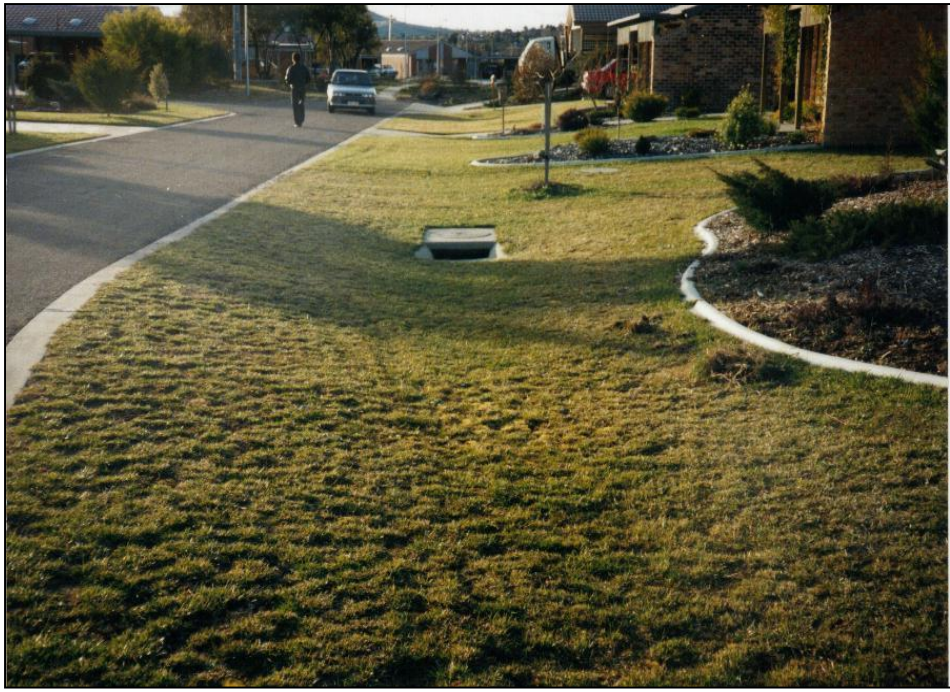
- Collect floating litter, debris and coarse sediment.
- Some designs also collect oil
- Generally not effective against fine sediment
- Some reduction in other pollutants attached to sediment
- Drastic improvement in river WQ


Wetland draining into
Stormwater Quality pond
Stormwater Quality Facilities


Forebay to collect Sediment
before detention pond

Combined Water Quantity and Quality Pond – Housing Area in Denver

Put in More Swales

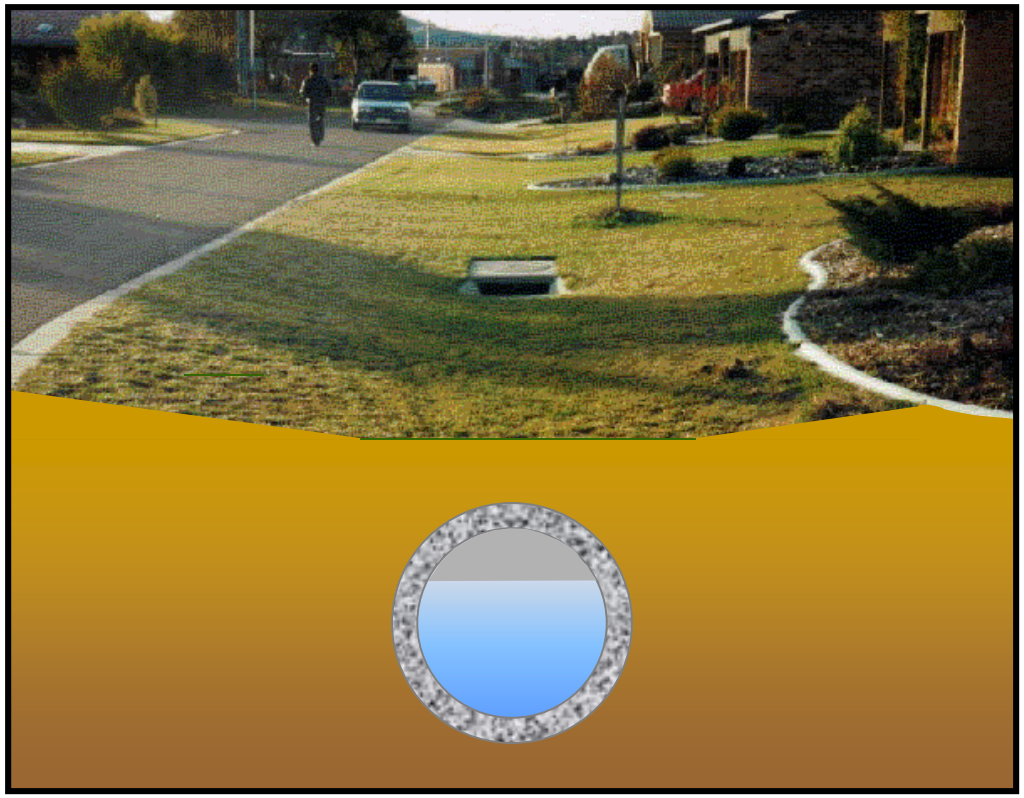


Dry Pond for Quantity and Quality – Office and Carpark area

‘Pretreatment’ necessary for all Surface Runoff into Drains

Otherwise pollutants build up into larger concentrations

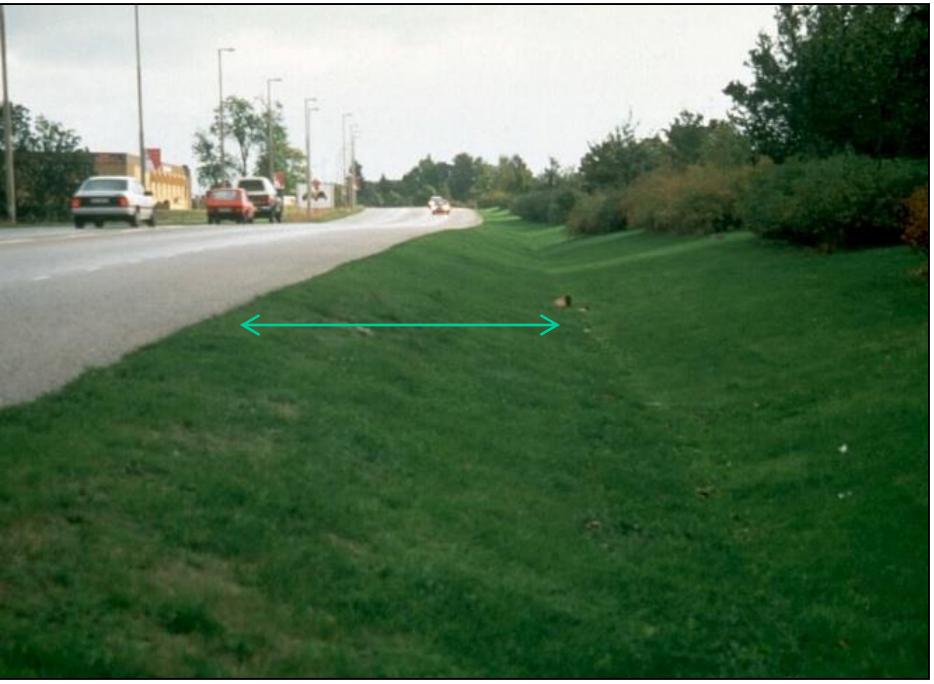

R/water runoff goes direct to Drains via inlets – no filter



Swale with Pipe Drainage (HDPE or Bioecods) – for Water Quality control and People friendly environment

Swales filter Runoff, v friendly area for traffic, people

(Berms hv merged with the Drains)



Recommendations

1. Fine tuning of New JPS directive on Water Quality compliance for Developers – internally or consultancy

2. Issue of New Directive on Water Quality for new developmts

3. On similar terms as latest ESCP Approach – "Self Regulation"

4. JPS to do Roadshow – if possible together with that planned for ESCP "Self Regulation"

5. Selected core of JPS engineers for CPSWQ

6. Development of MSO's own certification program "Certified Professional in Urban Stormwater Mgt MSMA"
Or Adopt present ECI program CPISM (Cert Prof in Industrial Stormwater Mgt)