



BMPTRAINS MODEL: BACKGROUND INFORMATION ON SWALES

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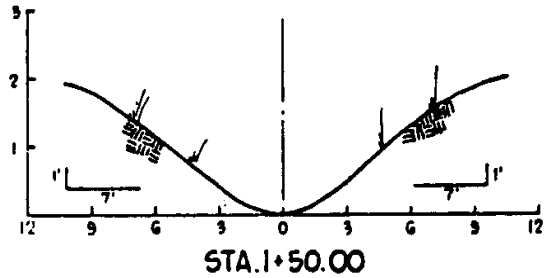
METHODOLOGIES SWALES

From Avellaneda, Eduardo. 1985. M.S. Thesis, UCF

RETENTION BASIN	WET DETENTION	EXFILTRATION TRENCH
PERVIOUS PAVEMENT	STORMWATER HARVESTING	FILTRATION including BIOFILTRATION
GREENROOF	RAINWATER HARVESTING	FLOATING ISLANDS WITH WET DETENTION
VEGETATED NATURAL BUFFER	VEGETATED FILTER STRIP	TREE WELL
RAIN (BIO) GARDEN	SWALE	USER DEFINED BMP

SWALE

FIELD AND LAB MEASUREMENTS



Site Classification

$C = 2.08$
 $C_u = 1.33$
 $K_d^Z = 4.068 \text{ in/hr}$
 Longitudinal Slope: 0.0279

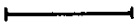

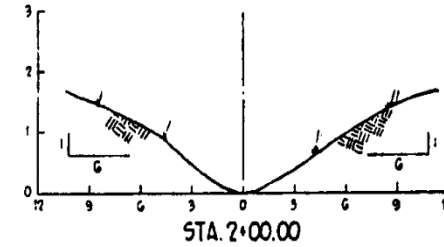
Horizontal Scale: 6' = 
 Vertical Scale: 2' = 

Figure 5. Swale at I-4 Maitland Interchange-East.



Site Classification

$C = 1.81$
 $C_u = 1.28$
 $K_d^Z = 3.118 \text{ in/hr}$
 Longitudinal Slope: 0.0133



Horizontal Scale: 6' = 
 Vertical Scale: 2' = 

Figure 8. Swale at Reed Road-Chuluota Area.



GRAPH TO AID IN SPACING

80% Capture

5% slope



Downstream

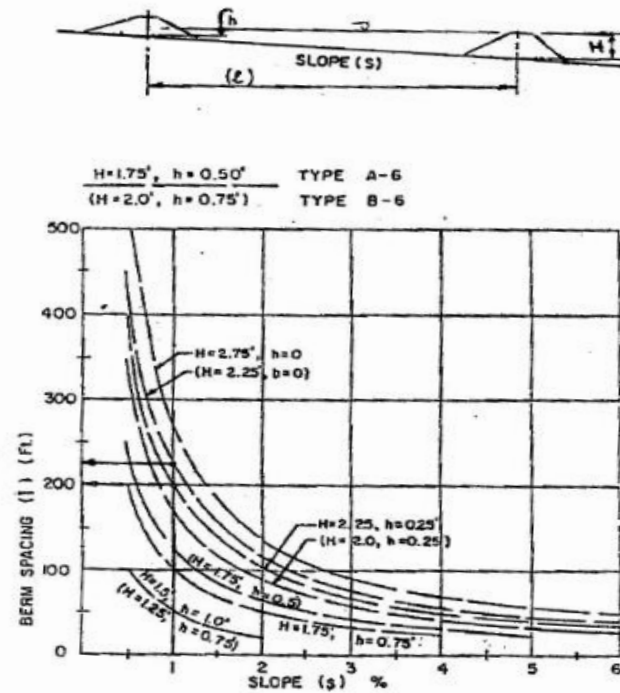
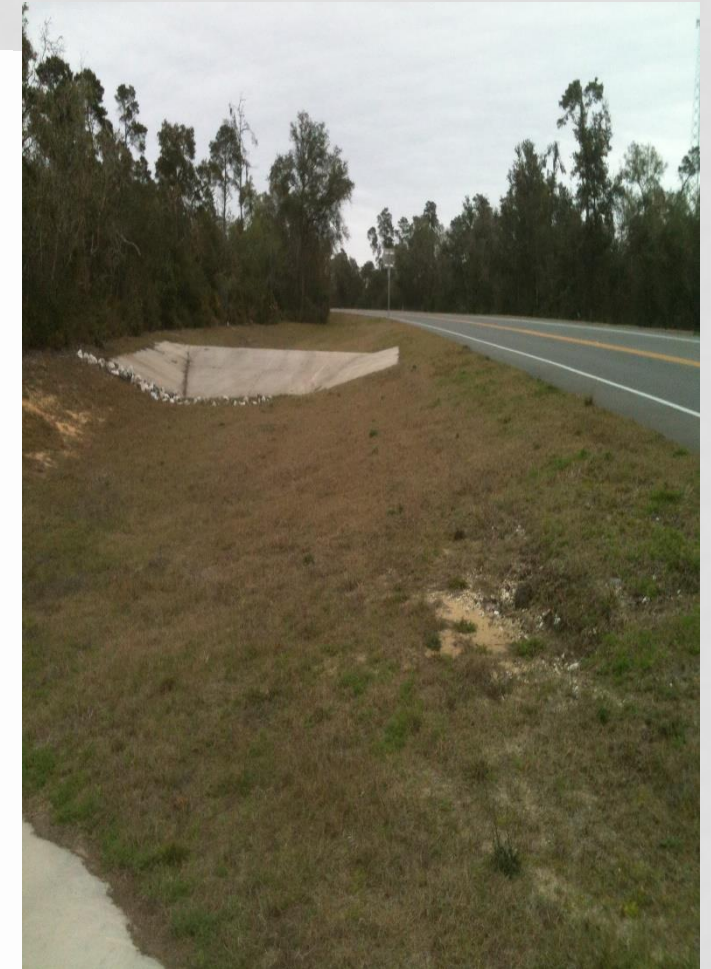


Figure 3 Berm Spacing (L) as a Function of Berm Heights (H, h) and Slope (s) for Swale of Side Slope of 6 on 1

(from Rehmann-Koo, 1984)



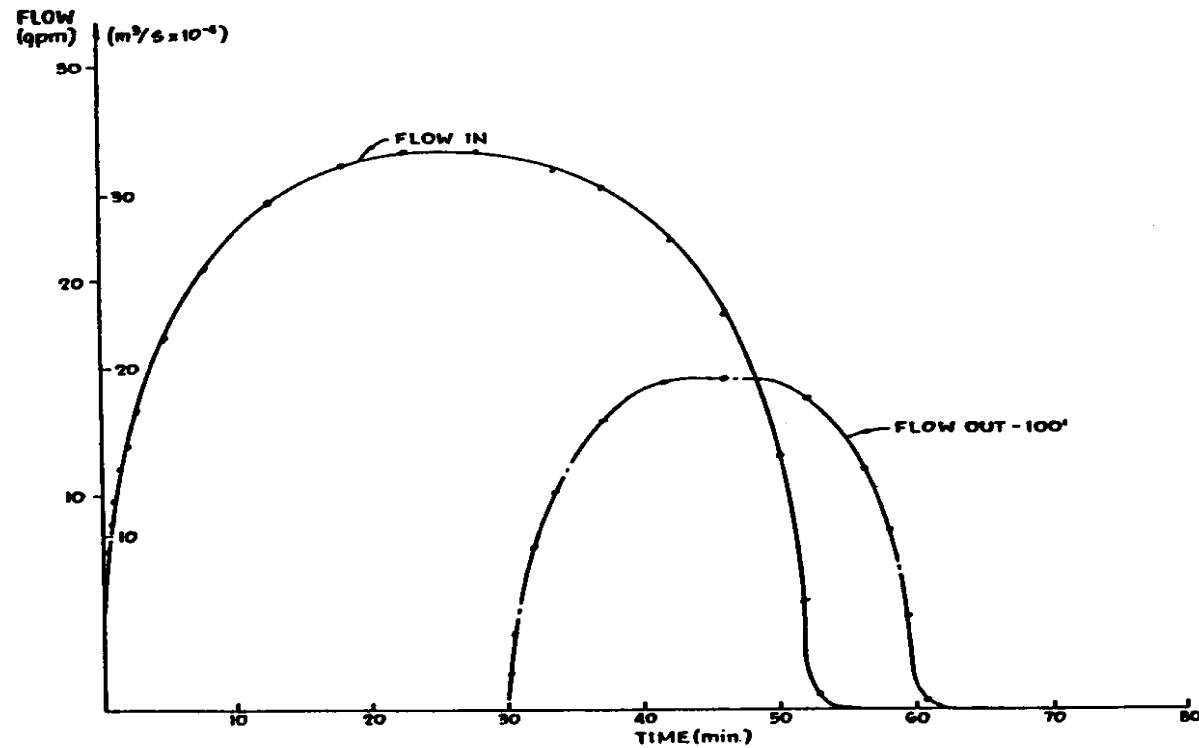
Upstream

RATIO OF LAB AND FIELD MEASUREMENTS

SCS PERMEABILITY (in/hr)	LAB PERMEABILITY (in/hr)	SLOPE	SOIL DENSITY (lb/ft ³)	DOUBLE-RING INFILTRATION RATE (in/hr)	AVERAGE MASS BALANCE INFILTRATION RATE (in/hr)
10-20	10.871	0.0052	108	12.86	9.48
10-20	7.70	0.0133	112	13.46	8.50
10-20	15.379	0.0048	90	19.75	14.39
5-10	7.228	0.0075	110	7.41	4.08

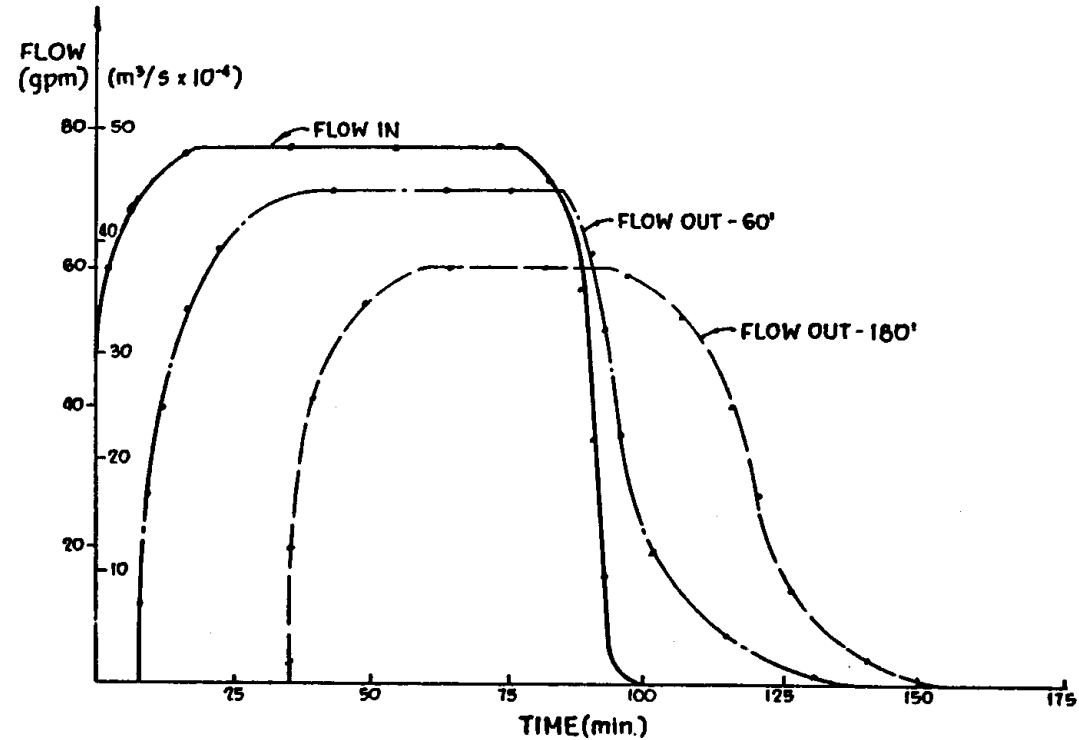
RATIO MASS BALANCE INF PERMEABILITY	RATIO MASS BALANCE INFIL DOUBLE-RING INFIL
0.56 0.78	0.55 0.52

HYDROGRAPH WITH SWALE BLOCK



Mass balance average infiltration rate about 5 inches/hour

SWALE WITHOUT SWALE BLOCK



Mass balance average infiltration rate about 2 inches/hour

PROGRAMMING OF EQUATIONS (AN EXAMPLE)

$$L = \frac{21,032 Q^{5/8} Z^{5/8} S^{3/16}}{n^{3/8} (1 + Z^2)^{5/8} i} \quad (A-18)$$

where:

L = length of swale (ft)

Q = average flow rate to be percolated (cfs)

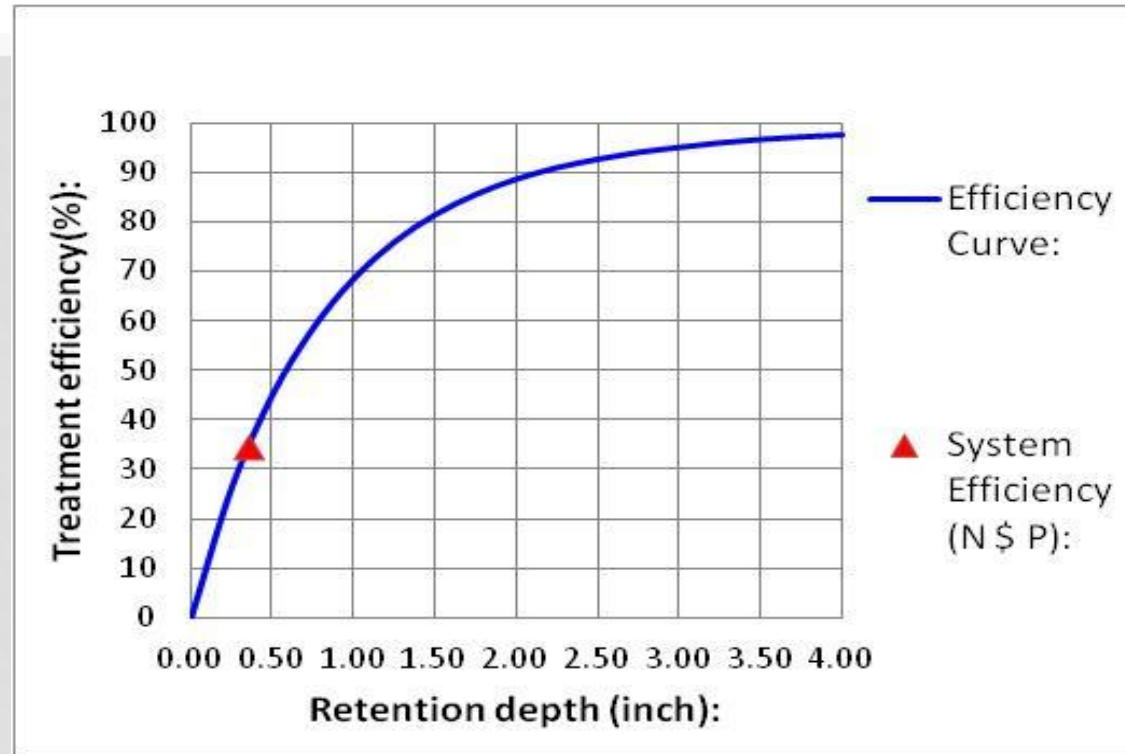
Z = horizontal distance per one foot of elevation change inside slope

S = longitudinal or flow slope

n = Manning's Roughness Coefficient

i = infiltration rate (in/hr)

EXAMPLE OUTPUT SWALE DESIGN



REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH SWALE. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH SWALE.

Remaining treatment efficiency needed (**Nitrogen**):

69.346 %

Required pre-treatment efficiency (**Phosphorus**):

69.346 %



QUESTIONS, REMARKS AND DISCUSSION

THANK YOU!

