

CATCHMENT ANALYSIS PRE - POST DEVELOPMENT VER 1.1 Jan 2021

Site: Makhalempongo Chicken Poultry Farm (Killarney)
 Descr: PRE and POST development
 lat 29°47'53.55" long 30°34'38.04
 Anal. by: N. MKHWANAZI
 Date: 31-Jul-22

Site Area (m ²)	Tc pre (min)	Tc post (mins)
113050.00	15.00	15.00

RI (yrs)	RI Reduction factor ft	RAIN DATA mm/hr		Ipre	Ipost	Q PRE	Q POST	Reqd Storage 2xTc	Total hardened area runoff	mean runoff	area1	area2	area2 alt	area 3	inter y2/y1	inter y2/y1'		
		CT PRE de	CT POST de															
2	0.75	0.32	0.66	51.72	51.72	51.7	51.7	0.517	1.078	505	505	673	505	0	0	0	20	30
5	0.8	0.34	0.71	77.59	77.59	77.6	77.6	0.827	1.725	808	808	1010	808	0	0	0	20	30
10	0.85	0.36	0.75	86.21	86.21	86.2	86.2	0.977	2.037	954	954	1122	954	0	0	0	20	30
20	0.9	0.38	0.80	107.76	107.76	107.8	107.8	1.293	2.695	1262	1262	1402	1262	0	0	0	20	30
50	0.95	0.40	0.84	137.93	137.93	137.9	137.9	1.747	3.642	1705	1705	1795	1705	0	0	0	20	30
100	1	0.42	0.89	172.41	172.41	172.4	172.4	2.298	4.792	2244	2244	2244	2244	0	0	0	20	30

DWA METHOD		PRE/RURAL Runoff Coefficient		POST/URBAN Runoff Coefficient	
Catchment MAP	MAP	URBAN %			
Catchment Slope CS	%	> 900mm			
< 3%	0	0.05	Lawn sandy<2%	0	0.08
3-10 %	45	0.11	Lawn sandy>7%	0	0.18
10 - 30 %	45	0.20	Lawn heavy<2%	0	0.15
> 30 %	10	0.30	Lawn heavy>7%	10	0.30
Soil Permeability Cp	%	100	Residential single	0	0.50
Very perm (Dunes)	0	0.05	Flats/dense townships	0	0.60
Perm (light soil)	60	0.10	Industry , light	0	0.65
Semi (most soils)	20	0.20	Industry , heavy	0	0.70
Imperm (rock, paving)	20	0.30	Business local	0	0.60
Vegetal growth Cv	%	100	Business CBD	0	0.85
Dense bush, forest	70	0.05	Streets/roofs	90	0.95
Cult land, sparse bush	15	0.15		100	0.89
Grassland	15	0.25	AREA WEIGHTING FACTORS		
Bare Surface	0	0.30	RURAL	0.00	0.42
Rural Catchment coeff	Ct =	0.42	URBAN	100.00	0.89
			LAKES	0	0.00
			Cdesign	100	0.89

Tc Rational METHOD "KERBY" FORMULA	
Overland flow T(mins) = 36(rD/1000/S) ^{0.467}	
Dist (m)	r factor
400.00	smooth paving 0.02
Slope	clean soil 0.10
1.53	sparse grass 0.30
	mod grass 0.40
	thick bush/gras 0.80
	choose r 0.40
T overland (mins)	13.86
Velocity (m/s)	0.48

NOTE: distance used should not exceed 200m

Q, Vel, Time of concentration - defined watercourse/open channel/pipe/box culv					
INPUT	OUTPUT	n values			
Manning n	0.011	SHAPE	Qunif=VA	Vel V	Tc mins
Slope (m/m)	0.025	Trapezoid	0.27	2.74	0.912
Width (m)	1.000	rectangle	0.27	2.74	0.912
Depth (m) not fo	0.1	FullBoxCulv	0.18	1.83	1.366
path/distance (n	150	Triangle	0.00	0.02	128.149
side slope 1:?	0.001	Gutter	0.00	0.01	203.424
pipe dia (m)	0.45	FullPipeCulv	0.53	3.35	0.746

NB Pipe is assumed full

SHORT STEEP BOX CULVERTS				INLET COEFF C		SHORT STEEP PIPE CULVERTS <= 250 mm dia				
HEAD H (m)	span B	depth D	H/D	SQUARE	ROUND	HEAD H	DIA D (m)	H/D	slope	0.01
5	0.8	0.80	6.25	0.9	1.0	1	0.35	2.857142857	0.01	0.01
Q=2/3CBH(2/3gH) ^{0.5} for H/D<1.2				H/D>1.2		Q=0.35g ^{0.5} d ^{0.85} H ^{1.639}				
Q=CBD(2g(H-CD)) ^{0.5} for H/D>1.2				H/D>1.2		Q=0.43g ^{0.5} d ^{1.855} H ^{0.817}				
				0.6		0.230128008				

0.40 sloped culverts

0<h/d<0.8 H/D>0.8 q=D2xsqrt(gD)x0.48(S/0.4)0.05*(H/D)1.9
 0.8<H/D<=1.2 0.8>H/D>1 q=D2xsqrt(gD)x0.44(S/0.4)0.05*(H/D)1.5
 h/d>>1.2 0.255698 q=0.6pi*d2/4sqrt(2gh)

Broad crested Weir Q=1.65xLxD1.5	
Length L (l) Depth(of flow)	5 0.20
Q=	0.738

Sharp crested Weir	
q=2/3x(0.611+0.08x(h-d)/d)x(2gx)0.5x(h-d) ^{1.5}	
h=height water above datum	h d
d=height of weir above datum	1 0.90
q=Q/m=	0.058

Grate inlet (or kerb inlet) operating as a weir at a low point-with low flow depth Q=1.6*(Perimeter)*D1.5			
Flow depth	Length	width	
0.15	2	0	
Q=	0.186		

NB flow depth assumed max of 0.5 width/length and less than kerb inlet height/opening.

Grate inlet operating as a orifice at low point-high flow depth			
0.67*A*(2gd) ^{0.5}	Flow depth	Length	width
Q=	0.4	2	0.4
	depth	m3/s	

NB flow depth at least half width or length

MAN NING n FOR OPEN CHANNELS		n=(n0+n1+n2+n3+n4) x m	
Material	Concreted	0.012	
	earth	0.020	
	rock cut	0.025	
	Fine gravel	0.024	n0
	Coarse gravel	0.028	0.012
Irregularity	Smooth	0.000	
	Minor	0.005	
	Moderate	0.010	n1
	Severe	0.020	0.005
Variation in ch	Gradual	0.000	
	Alternating Occ	0.005	n2
	Alternating Fre	0.01-0.015	0
Obstructions	Negligible	0.000	
	Minor	0.01-0.015	
	Appreciable	0.02-0.03	n3
	Severe	0.04-0.06	0
Vegetation	Low	0.005-0.01	
	Medium	0.01-0.025	
	High	0.025-0.05	n4
	Very high	0.05-0.1	0
Meandering	Minor	1.000	
	Appreciable	1.150	m
	Severe	1.300	1
			Manning n
			0.017